FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

Subsidies and Costs

IF the debate is any test of future fortune, Sir John Anderson is to be congratulated on the lack of serious opposition to his first Budget. Almost the only general criticism has been on the proposal to examine the subsidies question afresh and to revise the cost-of-living index; and here the apologetic tone of the Chancellor of the Exchequer suggested that he was not quite sure of the Treasury ground.

These two problems are theoretically separate, but in practice they must be treated as one. In the old days of the Tariff Reform controversy, it will be remembered that the Liberal Party advocated, or at least assented to, subsidies as the lesser of two evils; but it was not on that ground that they were adopted in the early days of the war. They were introduced primarily as a tonic to British agriculture, and secondarily as a means of stabilising prices and the general cost of living. The fact that they have been subsequently used to fortify the national health is interesting and important, but, broadly speaking, irrelevant to the present issue.

The subsidies have fully justified themselves in stimulating food production at home, and so reducing our dependence on foreign and overseas imports. From that point of view they seem to have become an integral part of State policy, which it will be difficult to end after the war. But they have also kept down the cost of living in towns, and Lord Woolton is not the only industrialist who has paid unstinted tribute to their value in reducing the sharp and, indeed, grossly excessive incidence of up-and-down price gradients in the prices of bread and meat.

It is not a negligible fact that the people of this country pay only 9d. for a 4-lb. loaf, whereas the price in the great wheat-growing countries ranges from a shilling to fifteen pence.

Admittedly, subsidies have to be paid for, and paid for by the beneficiary. But since the duty on tobacco produces more than the total amount of the subsidies, the cost of living is manifestly kept down by the cloud of smoke that goes up, and it would be difficult to contend that there is any fiscal impropriety in the exchange.

Sir John appears to fear that increased wages will force up the cost of living. There are grounds for thinking that something of the kind was in pro-

gress in the United States, where control was less rigid than here, and where civilian demand and consumption increased steadily with the vast increase in the national income during the past two years. But it must also be remembered that the American Congress has steadily rejected the policy of subsidies; and the usual assumption of economists, that there is a time-lag between rising prices and rising wages, was not on the whole falsified in this country during the earlier years of the war.

It might, indeed, be relevant to inquire how far recent demands for wage increases were related to the recent inclusion of the working classes in the income-tax paying category. The connexion would probably be found to be closer than is at present appreciated in Whitehall, and when Sir John has passed his Finance Bill through Parliament he may well find it useful to look into this aspect of the problem, as a guide to the future financial policy of the country.

Allowances for New Equipment

A prominent food manufacturer described the Budget as the most business-like for many years, and he expressed the view that it would be specially valuable to small firms that may be compelled to expend comparatively large amounts of capital in order to comply with Government post-war requirements. In connexion with this, two important questions arise out of the Chancellor's Budget statement—namely:

(1) Will the 20 per cent. allowance in respect of new machinery and plant apply to equipment purchased for purposes of replacement as well as to purchases for purposes of new development? and

(2) Will a manufacturer be entitled to claim an obsolescence allowance in addition to the 20 per cent. allowance during the year of purchase?

It is impossible to give a definite answer to either question until the Bill which is to give effect to the proposals has passed through Parliament. In regard to (1) above, the problem is to define "new machinery and plant." If the term is to mean only purchases made for purposes of expansion and for new businesses, and not for the replacement of existing equipment, the value of the concession will be limited. It might be argued that in such circumstances the concession would favour certain manufacturers at the expense of their competitors. Question (2) is whether a firm will be able to claim a total allowance of approximately 28 per cent., or only the flat rate of 20 per cent. in the initial year.

Inquiries in the most authoritative quarters suggest that manufacturers have every reason to hope for the best on both questions. It seems probable that the 20 per cent. allowance on new machinery and plant will apply to all such purchases irrespective of whether they are made for purposes of replacement or development. Moreover, although the 20 per cent. allowance will reduce the normal rate of allowance for obsolescence, the view is held in authoritative quarters that both allowances will be permissible in the initial year.

Food manufacturers of all descriptions who construct new buildings, including extensions to their existing premises, will also be able to claim the new 10 per cent. allowance on these structures.

These concessions are designed to enable industry to keep its buildings, machinery and plant in a constant state of efficiency and repair.

Ministry of Food Advertising

The results of the advertising of "Food Facts" have been beyond the dreams of a commercial advertiser, stated Mr. Sheldon Smith, Director of Public Relations at the Ministry of Food, at a recent Press conference. Measured by a consumers' survey they showed that 80 per cent. of the readers noticed the advertisement, 50 per cent. read it, and there were 130,000 requests for one recipe. Mr. Smith went on to say that "Food Facts" advertisements now appear in the advertising columns of newspapers which have a total circulation of about 70 millions a week.

When it was a question of such a straightforward job as selling dried eggs or household milk powder or potatoes, the result could be watched and measured much as a commercial firm would measure such advertising. To take one example, we know (said Mr. Smith) that last year the human consumption of potatoes was half a million tons greater than the record consumption the previous year, and that that was the equivalent of 3 lb. for every 2 lb. eaten before the war. "My advertising colleagues," Mr. Smith concluded, "give all the credit to the Ministry's policy, but we know, both in the Public Relations Division and in the rest of the Ministry, what a great deal of research and creative thought goes into putting over that sort of message. It is a fine tribute to all concerned that Press advertising has been made such a powerful and tactful servant of a Government Department."

Ice Cream Standards

Scarcely has the ink dried on the Articles of Association of the new Ice Cream Alliance than the Provisional Council has decided to make drastic revisions. The main reason is to delete the definition of ice cream that appears in clause 1 of the Articles and also clause 23, which requires members to agree to that definition.

Prior to the formation of the new trade organisation it had been agreed that no member of either of the parent associations—namely, the Ice Cream Association and the Associated Ice Cream Manufacturers, Ltd., would be prejudiced by the amalgamation, and that an ice cream standard

acceptable to members of both associations would be drawn up by the Alliance.

By a misunderstanding, however, the definition of ice cream that appeared in the Articles of Association of the A.I.C.M. was incorporated in those of the new Alliance. Difference of opinion in regard to the standard was, in fact, the main reason for the existence of two trade organisations. The A.I.C.M.'s definition was framed so as to safeguard small independent manufacturers who based their mix on liquid milk, but such a definition could not be expected to be acceptable to manufacturers of an American type of mix based on reconstituted butter and skim milk powder. On the other hand, the standard based on 8 per cent. butterfat suggested by the Ice Cream Association before the war did not meet with the approval of makers of the Italian type of mix.

The Alliance proposes to delete all mention of a definition or standard for ice cream from the Articles of Association. At an early date a subcommittee will probably be appointed to frame proposals for a standard that will be acceptable to all sections of the trade. The Ministry of Health is expected to introduce a statutory standard, in collaboration with the Ministry of Food, after the war, under the Food and Drugs Act, 1938, and the trade wishes to be prepared for that eventuality. Discussions on the matter took place between the Ministry of Food and the old associations last year, but no decisions were taken.

Some members of the trade take the view that British conditions require two standards, one for the American and one for the Italian mix, but others doubt whether the Government Departments would agree to that. There is a considerable body of opinion that believes that war-time experience has shown that any qualitative standard should not be based on milk fat alone.

Control of Milk Production

The proposal to transfer the control of milk production on the farm to the Minister of Agriculture is one which will be welcomed by all unbiased scientists, if only for the fact that it will replace the present irregularities in administration by a unified system administered by a single authority.

Experience with the Accredited Scheme has shown abundantly that a scheme which is inherently good may be nullified by differences in efficiency and interpretation by local authorities. Some are very good, but in some areas the conditions for obtaining a licence amount to little more than a farce. For example, a licence may be granted in winter when almost any milk will pass the test, and the local authority may fail to test or withdraw the licence in summer.

The greatest failing of the scheme has been that it touched only the best producers. The new scheme of the Ministry of Agriculture will ultimately control all dairy farms and test regularly the milk of all producers by a keeping-quality test, such as the resazurin test. It is to be hoped that soon all producers' milk will also be tested regularly for total solids—*i.e.*, nutritive value—and payment based on these two aspects. A scheme for quality payment was described in an article by Dr. J. G. Davis in FOOD MANUFACTURE, December, 1941.

We may therefore envisage a national control scheme for milk on the following lines: The Ministry of Agriculture will control milk production on the farm, and the testing of all producers' milks. The Ministry of Food or the Milk Marketing Board will buy the milk on a quality basis, and sell to the distributors and manufacturers. The Ministry of Health will protect the health of the consumer and test milk as delivered by the distributor.

Selling the Meat Protein Story

We have heard a great deal about the increased health of the nation under wartime conditions. Among other causes has been mentioned the decrease in meat consumption, and a few months ago this doctrine was given out to several million people through the medium of the B.B.C. Brains Trust. The writer of a letter to the *Meat Trades Journal*, in pointing out that it is among what he terms the "lower working classes" that the marked improvement in health has occurred, says that this class of the community have been eating anything between 100 and 300 per cent. *more* meat than before rationing, the reason being that they have more money to buy it.

It would seem therefore that there is little need for propaganda for meat in this country if the writer quoted above is right. But in the U.S.A. the industry thinks differently. The American Meat Institute is conducting, during the next twelve months, a "smashing educational drive" in order to emphasise the superior nutritional qualities of meat.

In December the Institute published a pamphlet explaining the potential threat to the meat industry created by a flood of "just as good as meat" publicity, which gives a list of slogans from current advertisements, such as "Down with meat," and "An excellent meat substitute because it's high in protein." Soya beans and enriched bread are two of the principal food products against which the Institute has lodged complaints for the nature of their advertising. Much of the anti-meat publicity, the Institute believes, springs from an honest lack of basic protein information. That is the present position in the U.S.A.

In this country at the moment the apotheosis of meat would be taken as not quite a nice sort of joke, and the movements of the "eat more" symphony of pre-war days are now being played with the potato as *motif*.

Fresh Fish Supplies

Freezing will have the biggest influence on the future of all the fishing industries of the world.

Stating this to the Scandinavian-British Social Club in Aberdeen, Dr. G. Reay, head of the Torry Research Station, visualised the day when we should be able to have any kind of fish anywhere, at any time, of the same high standard as when freshly caught. Presumably, he added, we should have it set at a fairly steady and fixed price.

Fish must be put into cold storage absolutely fresh. A lot of the prejudice against cold storage in the past had been because it was used as a "last hope."

It was important to store fish at a low enough temperature. By this means fish in excellent condition could be eaten four or five years after catching.

Dr. Reay showed a film on the handling and storage of fresh fish illustrative of the work of the Torry Research Station. Short documentary films about Sweden and her industries to-day were also shown, for the first time in this country.

Mr. H. N. Claeson Gordon, Cluny Castle, who presided, gave some official Swedish comments on recent events. In spite of all misunderstandings in these years of war, Sweden preserved a living faith in a northern reunion, based on deeper understanding and wider co-operation.

The Shortener Tolerance of Flours

A paper by F. R. Schwain and H. J. Loving on the shortener tolerance of biscuits and self-raising flours has recently been published in *Cereal Chemistry*, XXI, 1, 27. Summarising the results of their studies, the authors find that:

The optimum shortener level for flours of the type generally supplied for biscuit-making purposes is approximately 19 per cent. Commonly used test-biscuit formulas specify 12·5 per cent. shortening. In employing this high shortening level, the absorption must be decreased to compensate for the effect of the extra fat on dough mobility; a decrease in water absorption of about 0·4 per cent. is required for every 1 per cent. increase in shortener.

Comparative biscuit tests with a liquid (cottonseed oil) and a solid shortener (hydrogenated shortening) indicated that the optimum shortening level is independent of the type of shortener.

Biscuit flours of varying strength, as indicated by protein content and viscosity, did not differ materially either in their tolerance to varying percentages of shortening or in the quantity required to yield optimum biscuits. However, the softer flours gave the superior biscuits and maximum biscuit quality was obtained with slightly lower percentages of shortening than are needed with the stronger flours.

Food and the Teeth

Sir Norman Bennett, in a lecture given to the Food Education Society, said that knowledge is not yet complete, but enough had been accumulated to enable us to say that the reduction in the incidence of dental disease is now mainly a political and sociological problem.

He said that there is no doubt that our jaws have been getting smaller through many generations, giving rise to crowded conditions of the teeth and defective biting. The reduction in size of the jaws may be ascribed to two causes which really amount to one. There has been a progressive change due to disuse which has become an hereditary tendency. He quoted Sir Arthur Keith's statement that "contracted palates, crowded and defective teeth, deformed jaws, sunken cheek-bones do not become common in English graves until we reach the eighteenth century."

While pointing out the adverse influence of sugar and highly milled cereals in the diet, Sir Norman mentioned that investigations in the Kangra Valley, Northern India, indicated that the physical character of foodstuffs and the maintenance of a traditional self-cleansing diet, including fruits and vegetables, are factors of infinitely more importance in the prevention and control of dental decay than chemical and vitamin content.

Too little attention was being paid to the physical character of foods and perhaps the vitamin element tended to be overstressed. The detergent qualities of natural foodstuffs should not be lost sight of. To the tag, "an apple a day . . ." might be added "an apple at night . . ." as a cleanser. In wartime a carrot may be substituted for apple.

Enzymatic Digests of Meat

The idea of the treatment of meat by papain is far from new. Shortly before the present war a preparation was put on the market which, it was claimed, sprinkled over a tough joint, made it tender. We also remember an overseas project which aimed at hydrolising the whole beef carcase and shipping it to this country as a paste. G. Y. Gottschalk (*Food Research*, 9, 1, 6) has described the preparation of meat digests which he suggests are of special interest because they can be dried and sterilised more easily than untreated meat. The main object of his paper is to discuss the activation of papain which takes place during the digestion.

His conclusions are that papain that is inactive by the usual tests may be very active in the digestion of meat or other products containing sulphydryl groups or capable of producing them during proteolysis. Activation increases as digestion progresses. Preliminary activation of papain for use on such substrates is therefore unnecessary.

The Spray Drier—its Possibilities in Industry

D. W. BICHENO, B.Sc., A.R.I.C.

FOR MANY years such industries as the chemical, pharmaceutical and food processing have been seeking means whereby products, either as intermediates or as the finished article, can be obtained in a finely powdered state with the minimum of contamination from plant sources. To a considerable extent such difficulties are being overcome in various ways, although not always by the most satisfactory methods as far as the presentation and elegance of the product is concerned. It is not an easy matter to avoid the inclusion of small amounts of impurities from a unit operation such as grinding; however, the introduction some thirty years ago of dried milk for infant feeding focused the attention of manufacturers on a process in which both drying and powdering of a material could be achieved simultaneously with little or no chance of contamination of the product.

The two methods employed to-day in the dried milk industry are the roller or " drum " drying process and spray drying. It is with the latter that this article is concerned. Undoubtedly the large-scale drying of milk and of egg by the spray process during this war has done much to stimulate interest in the potentialities of this drier. Further, at the British Pharmaceutical Conference of 1942 and 1943 a group of workers from Victoria University, Manchester, discussed at length their researches into the utility of the spray drier for preparing certain " difficult " pharmaceutical products in fine powder form.

Fields of Operation

With the growth of the manufacture of food products, fine chemicals and pharmaceuticals, and the prospect of further expansion in the post-war period, manufacturers will be looking for means, wherever possible, of increasing their output, raising the efficiency of their processes, and improving the quality of their products. To attain these ends it will be necessary in many cases to install new plant, both to replace existing plant and to supersede semi-laboratory scale equipment. With this in view, this article will proceed to discuss the merits of one particular piece of plant—namely, the spray drier.

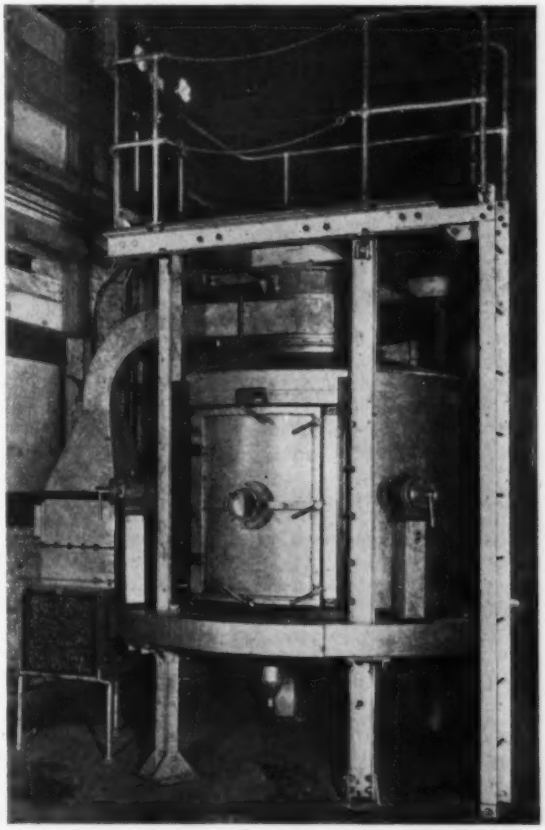
The outstanding characteristic of this apparatus is the exceedingly short time of contact between the material to be dried and the drying medium (usually hot air). In the case of milk the liquid is transformed to a dry powder in about thirty seconds.

Advantages of Spray Drying

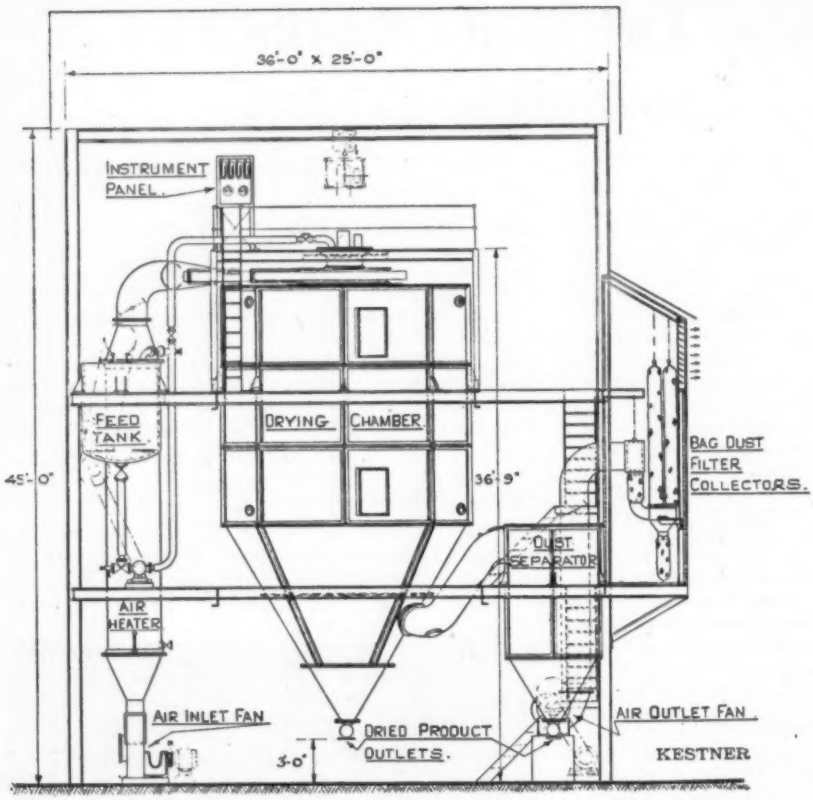
The peculiar advantages of this type of drier for materials which may suffer discoloration, oxidation, decomposition or loss of flavour for any but the shortest time of contact are obvious, and has led to its adoption for drying such a variety of products as milk, egg, yeast and vegetable extracts, fruit juices, blood plasma, saponin, adrenalin, digitalis, ascorbic acid, penicillin, metol sulphate, ferrous ammonium citrate, sodium salicylate, precipitated chalk, glue, tannin extracts, leuco-base of dyes, etc. However, the usefulness of this process is not limited to the drying of heat labile materials, but is of great value in obtaining as a fine powder substances which are otherwise difficult to obtain as a dry solid (*e.g.*, glucose). Similarly, it may be used with advantage to obtain a dry homogeneous product from solutions or suspensions of two or more substances, or in any instance where a uniform free-flowing product of low bulk density is desired.

Thermal Efficiency

It has been stated that the thermal efficiency of a spray drier is so low as to justify its use only with the more valuable materials. The heat requirements, between 2,000-5,000 B.T.U. per lb. of water evaporated,



A Spray Drying Plant.



Arrangement of Spray Drying Plant with Steam Heater and Bag Dust Collecting System.

are certainly higher than for most driers, but the fine uniform nature of the particles obtained will in many cases obviate the necessity for the subsequent stages of grinding and screening or blending, and the saving of power so effected should undoubtedly be considered when calculating the thermal efficiency of the process. Indeed, in certain circumstances the spray drier has been adopted solely because it is more economical in operation, both as regards power consumption and labour costs, than the use of separate drying, grinding and screening units.

Description of the Spray Drier

The general construction of the spray drier incorporates four main features :

1. Heater and fan to produce air at the required temperature and velocity.
2. Atomiser or jet to produce liquid particles of the required size.
3. Chamber in which the liquid droplets are brought into intimate contact with the hot air.
4. Means for collecting and removing the product.

The air heater, which is situated on the pressure side of the fan, is usually of standard design, and, according to the temperature desired (which may be anything between 200° and 1,200° F.), the heating may be by steam, hot oil, hot furnace gases or by electricity. The fan should be adequate to give the required air velocity at the chamber, usually between 50 and 150 feet per second. When a product is required with a high degree of purity, the air is first passed through a filter to remove air-borne impurities before entering the heater.

The Atomising Device

Perhaps the most important component of this drier is the atomising device. The oldest type is the jet, in which the liquid feed is pumped at pressures up to 2,000 lbs. per square inch through a minute aperture in a disc at very high velocities. Although this type is still used to a certain extent, it suffers from a number of disadvantages :

(*a*) When the spray leaves the jet it is projected into the chamber in the form of a cone of droplets, and intimate contact with air stream is difficult to achieve. This results in the particles produced being far from uniform in size.
(*b*) The minute aperture of the jet is liable to become blocked by small particles of extraneous matter in the feed, or clogged by premature evaporation.
(*c*) At high velocities erosion of the jet is comparatively rapid.
(*d*) In some cases the high pressure used may alter the physical condition of the material.

An improvement on the simple jet is the two-fluid nozzle, which employs air, or sometimes steam, at pressures of the order of 200 lbs. per square inch with low liquid velocities.

To some extent the centrifugal disc atomiser has now superseded the jet. With this type, trouble from clogging or blocking is obviously avoided; it may be operated with suspensions as effectively as with solutions, and gives a product of fairly uniform particle size. Trouble is, however, sometimes experienced on account of eddy currents set up by the motion of the disc, although this may be successfully avoided by finer control of the air stream. A variety of centrifugal atomisers have been designed, each differing in the shape and size of the disc, with the object of obtaining the maximum degree of dispersion of the droplets.

The Drying Chamber

The chamber, which is that part of the drier where the hot air stream and the droplets are brought into intimate contact and the sensible heat of the air replaced by the latent heat of the water evaporated, has been liable to a number of constructional variations. In the most popular design, as characterised by the Kestner and Douthitt models, the chamber has a cylindrical body and a lower conical portion. The atomiser is usually located at the top of the cylinder, and the product is collected in the base of the conical hopper and removed.

The chambers may vary according to the means adopted for the air stream distribution. The Kestner model, for example, employs two hot air streams, the main and more rapid one entering through a central distributor, while the subsidiary stream enters tangentially when, by means of baffles, a rotary whirling motion is imparted in the same direction as that given to the droplets by the atomiser, so that the air on impinging does not greatly deviate them from their course, until as they fall they are influenced by the main central air stream. The waste gas is passed out through a duct in the bottom of the chamber. In this type of spray drier, to prevent premature evaporation before the full dispersion of the droplets is obtained, a cold air supply is passed vertically down over the spray to cool the air in the vicinity of the atomiser. Unless

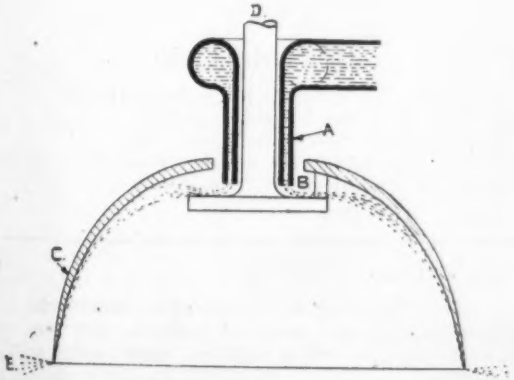
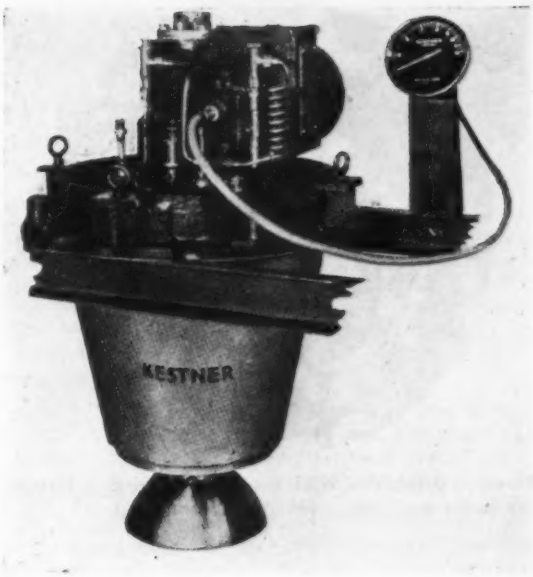


Diagram of Atomiser Disc.



Atomiser and Gear Box.

atomisation is uniform, some larger drops are formed which do not dry completely.

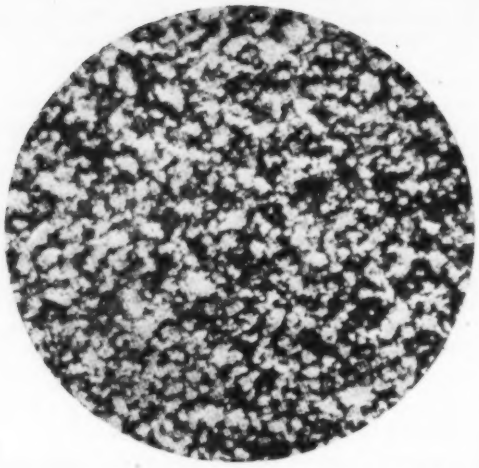
Contrasting Types of Chamber

In contrast, the Douthitt type has only one air blast, which is distributed by vanes in a circular head duct, the waste gas being removed at the top of the chamber. The Rogers or Merrel-Soule model has a body of similar shape, but the two atomisers and two hot air ducts are introduced through the side wall of the cylindrical portion, while the gas is exhausted through bag filters at the top of the chamber. These bags are fitted with mechanical shakers which operate with reversal of air blast when in use. The Schultz type also makes use of bag filters, situated round the side walls, for recovering powder from the exhaust gas, but it differs in that it has a body of square horizontal cross-section, with the atomiser and air ducting entering centrally at the top of the chamber. The chambers are usually of welded construction in mild steel, copper, tinned copper, aluminium or stainless steel.

The dimensions of the drying chamber, in particular the diameter, are of great importance. It is essential that for a given degree of atomisation the diameter will be sufficiently large to ensure that the particles do not hit the wall before they are dry, and, on the other hand, not so large that the atomisation and flow of gas cannot be controlled so as to ensure uniform interaction between the air and the particles. In general the minimum diameter to be used will depend on the uniformity and size of the particles leaving the atomiser. Diameters up to 30 feet are not uncommon in industry, yielding a particle size of 20 to 50 mesh; while diameters of less than 5 feet, although seldom encountered owing to difficulties in operation, give rise to a finer product of 150 to 300 mesh.

The bulk of the powder formed in the chamber falls to the bottom into the conical hopper, where it is

Powder produced with jet type atomiser. Irregular shape and size. (Mag. 9 diameters.)



The same powder produced with centrifugal atomiser. Uniform shape and size. (Mag. 9 diameters.)

removed, usually by a helical screw conveyor. But some of the finer powder is entrained and carried away by the air stream, and various devices have been adopted to recover it. The waste air may be washed with water by passing it up a small scrubbing tower down which water is flowing, or the gas may be scrubbed free of dust by the feed liquor before being pumped to the atomiser. More usually an air cyclone separator or a bag filter is employed. And in some cases where the product is sufficiently valuable an electrostatic precipitator may be used in conjunction with a cyclone separator.

Method of Operation

With normal operation, using a stream of hot air, the feed liquor enters at room temperature, and the product obtained is a fine uniform powder. In certain cases, however, when the material to be dried is not particularly sensitive to heat, the feed may be introduced in a superheated state and a cold air stream employed, " flash " evaporation and drying take place, with the liquid transferring both sensible and latent heat to the air stream.

The product resulting from this method is of a granular nature.

In practice trouble is sometimes encountered when the product is found to contain spherical particles with small amounts of air or water imprisoned inside. The pressure of the water vapour during drying is usually sufficient to burst the globules, but with very viscous feed liquids the walls may become too strong for this to happen. This difficulty can usually be overcome by mixing with the feed a small proportion of a liquid of high vapour pressure when the extra pressure ruptures the globules. Thus in the drying of maltose (specific gravity 1·242 at 18° C.) in an air stream at 116° C. the feed is mixed with 6 volumes per cent. of ether. The product is a dry powder of a density of 0·037 gm. of maltose per ml. when uncompacted.

There are few data or empirical relationships for the performance of the spray drier, but for the purpose of calculation or for predicting new operating conditions the psychometric chart may be used successfully, although the time of contact is too short to enable equilibrium to be reached.

Conclusions

As an example of the versatility of the spray drier, it may, on the one hand, be used to produce continuously as much as 500 lbs. of dried milk per hour as a fine powder free from contamination, or, on the other hand, the smaller size drier may readily be adapted to produce under sterile conditions, in continuous or batch operation, smaller quantities of valuable medicinal products. The spray drier has found its way into the heavy chemical industry, as, for example, in the processing of black caustic liquor or the drying of the dye indigo; the food industry owes much to its services in the production of such materials as meat extracts or soup and gravy powders; it has grown indispensable to the fine chemical and pharmaceutical industries; but there are still many fields to which it may with advantage be applied, and in the post-war expansion it may achieve the more universal use that it deserves.

BOOKS RECEIVED

Vegetables for Victory. By Ambrose Heath.
Recipes of the 1940's. By Irene Veal.
Writers' and Artists' Year Book. 1944.
Achievement in Feeding Britain. By Gerald Bullett.
Industrial Publicity. By C. K. Shaw.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

An Improved Method for Determining the Grade of Commercial Pectins

R. E. COX* and R. H. HIGBY†

PECTIN as produced varies greatly in its jelly-forming ability, depending upon the fruit from which it is derived and the method of manufacture. Jellifying ability is ordinarily expressed as "grade," the number of pounds of sugar one pound of pectin will jell under certain specified conditions. Since pectin is sold on a basis of grade, it is important that this property be determined as accurately as possible. Usually this is done by making jellies from pectin under controlled conditions for comparison by hand with jellies made from a standard pectin sample. Although remarkable proficiency can be attained by those experienced in this method, it is obvious that hand grading allows wide latitude for individual judgment and never can be entirely dependable or accurate.

The need for a more reliable method of testing has been recognised by pectin manufacturers generally. The Exchange organisation has continued its search since the start of pectin manufacture about twenty years ago. Six testers described in the literature, including the Tarr-Baker and the B.A.R.,‡ have been investigated, many others have been considered, and a number of our own design have been constructed and tried. As a result of this search, an instrument and method of use have been developed which allow grade to be determined with accuracy and precision.

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Principle of the Method

The principle upon which this method depends was first developed by two British workers, Lockwood and Hayes.[1] They measured the percentage sag or slump occurring when a test jelly was removed from its supporting container and inverted upon a glass plate. The original method was used in determining the strength of gelatin and agar jellies. The measurement was made with an instrument called by these workers a Ridgelimeter. It permitted measurements to be made to 0·001 inch over a distance of several inches. Four measurements were required to determine the amount of sag, followed by rather tedious calculations to determine the percentage. Early tests in our laboratories indicated that the principle was sound, but that the method was too complicated for routine use.

The present modification of the Ridgelimeter requires only one measurement and entirely eliminates calculation in arriving at the percentage decrease in height

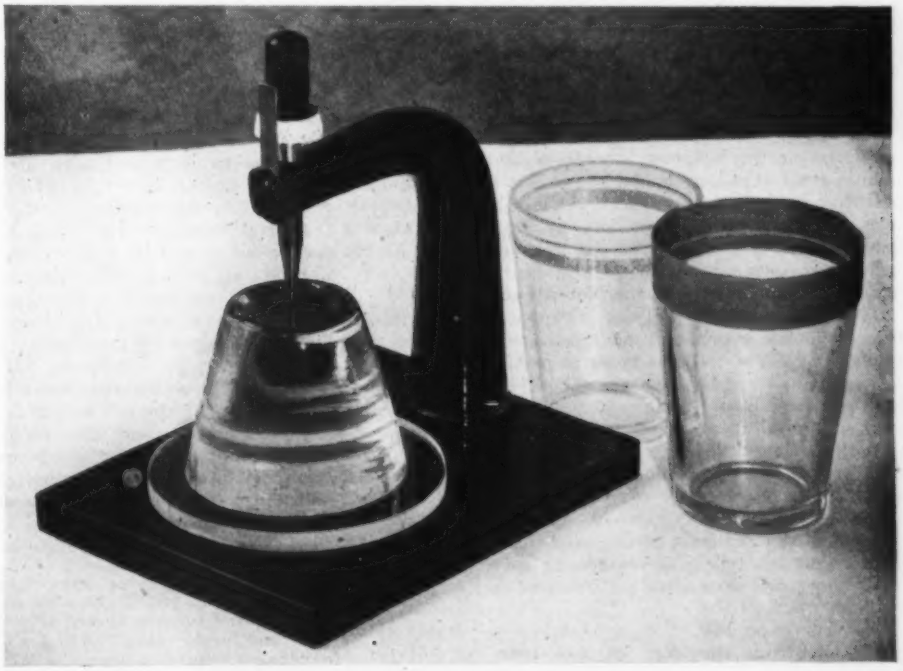

Fig. 1.—The tester with a jelly in measuring position and jelly glasses with and without "sideboards."

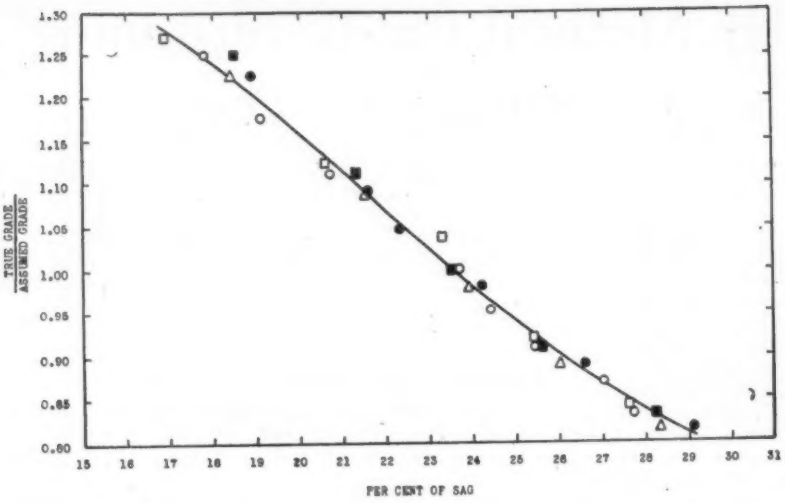

Fig. 2.—This curve is a compromise drawn by inspection from the data of five types of pectin. It was plotted with per cent. of sag as abscissa and true grade divided by assumed grade as ordinates.

of the test jelly. This is accomplished by using jelly glasses of definite depth with a measuring device which gives the per cent. decrease in height directly. Removable " sideboards " are provided on the glasses to permit overfilling, then, after the jellies have set, the excess jelly is sliced off level with the rims of the glasses. This gives a supported jelly of definite known height. When inverted with the container removed, the decrease in height is read as per cent. of sag by a single setting of a micrometer screw.

Fig. 1 shows the tester with a jelly in measuring position and jelly glasses with and without " sideboards." The glasses have a standard depth of 3·125 inches. The micrometer screw has thirty-two threads to the inch; therefore, one revolution moves the point 0·03125 inch, or 1 per cent. of the supported height of the jelly.

Calibration Curve

In the pectin industry at present there exists no definition of standard firmness for test jellies. Each manufacturer has his own conception of standard firmness, with competitive necessity as the only harmonising factor. On this basis the data presented here define our own conception of standard firmness and should be considered with this limitation in mind.

To correlate per cent. of sag with standard firmness, five composite samples were prepared, representing many lots of five different types of pectin made by the Exchange. All of the components had been standardised as carefully as possible by hand grading. Jellies were prepared at standard grade and at definite percentages above and below grade. Then after the per cent. of sag was determined on each glass of jelly it was possible to plot the curve shown in Fig. 2. It is evident that our conception of standard firmness is defined as 23·5 per cent. of sag, and that by the use of a curve of this type jellies made as much as 20 per cent. above or below standard firmness can be graded with accuracy.

The curve of Fig. 2 is a compromise drawn by inspection from the data of five types of pectin. Originally five curves were prepared, but it was found that one curve was satisfactory within limits of accuracy of the method.

The curve was plotted with per cent. of sag as the abscissa and true grade divided by assumed grade as ordinates. The use of this curve is shown by the following example.

Suppose that a jelly was made at 200 grade and that it showed 26·0 per cent. of sag. Fig. 2 indicates that the true grade is 0·9 of the assumed grade, or 180.

Preparation of Test Jellies

Jelly batches used in calibrating the tester were made by the following formula and method:

Distilled water ...	450 ml.
*Pectin (150 grade)...	5·20 g.
*Sugar (sucrose) ...	775 g.
Cook to	1,200 g. final weight

The pectin is mixed with about 50 g. of the previously weighed sugar, and the mixture is thoroughly dispersed in the water in a tared jelly pan of about 2 quarts capacity. Stirring is continued as the dispersion is heated to a full boil, then the remaining sugar is added. Heating and stirring are continued until the liquid again reaches the boiling point. The net weight is checked, and if necessary is adjusted by further boiling or by the addition of distilled water. If it is necessary to add water, this should be added in excess and the weight readjusted by further boiling and stirring. When the net weight is correct, the liquid is skimmed and poured into four previously prepared glasses equipped with " sideboards " and containing 2·0 ml. of tartaric acid solution (488 g. acid per litre of solution). The liquid is stirred during pouring to thoroughly incorporate the acid. With the containers filled to capacity the net weight of jelly is about 273 g.

* At assumed grades other than 150 an amount of pectin equal to 780 divided by assumed grade is used. The weight of sugar is altered to make the total weight of sugar and pectin equal to 780 g. The final jelly contains 65 per cent. soluble solids.

TABLE 1

THE EFFECT OF STORAGE TIME AT 25° C. ON PER CENT. OF SAG

Glass Number.	Storage Time. 16 Hours.	24 Hours.	40 Hours.
	(per cent.)	(per cent.)	(per cent.)
1	23·7	23·4	23·2
2	23·8	23·7	23·2
3	23·9	23·5	23·4
Average ..	23·8	23·5	23·3

TABLE 2

THE EFFECT OF STORAGE TEMPERATURE ON PER CENT. OF SAG

Glass Number.	Pectin A. 20° C.	30° C.	Pectin B. 20° C.	30° C.
	Per Cent. of Sag.			
1	23·2	23·7	23·1	23·6
2	23·3	23·7	22·8	23·4
3	23·3	23·6	23·4	23·6
4	23·3	23·2	23·5	23·6
Average ..	23·3	23·6	23·2	23·6

The filled containers are covered and set aside for 18 to 24 hours.

Use of the Jelly Tester

At the end of the storage period the paper strips acting as " sideboards " are removed and the exposed jelly is sliced level with the rims of the glasses, using a tightly stretched wire (cheese-cutter). The disc of excess jelly is discarded. The jelly is then turned out of the glass in an inverted position on the circular glass plate provided with the instrument. The plate is placed on the base of the tester with the jelly centred under the point of the micrometer. Two minutes after turning out the jelly the point is made to touch the jelly surface by carefully turning the micrometer head and watching for the first sign of contact. Sag is read to the nearest 0·1 per cent. The jelly is either discarded or reserved for judgment of texture. The glass plate should be washed and dried between determinations. Several jellies from the same batch should be tested and the average per cent. of sag used in computing the grade of the pectin.

It was thought that the length of time the jellies are allowed to stand before grading might have an important influence on firmness. To investigate this point the data of Table 1 were obtained. It is seen that the difference between 16 hours of storage and 40 hours is only 0·5 per cent. of sag, which, as shown by the curve of Fig. 2, amounts to only 2 per cent. of the pectin's true grade. For convenience, a storage period of 18 to 24 hours is adhered to, permitting jellies to be made one day and tested the next morning.

The data of Table 2 show the effect of storage temperature, which also may be assumed to be the jelly temperature at the time of testing. The variance between 20° C. and 30° C. is so small that under ordinary conditions temperature control is unnecessary.

Reproducibility of Results

Table 3 shows the precision of duplicate determinations. Pectin C was tested six times over a period of two weeks. The data show a difference of plus or minus one grade point from the average indicated value of 154. Pectin D was similarly tested four times with slightly less accurate results. Compared with hand grading, the reproducibility of results appears to be very good.

Table 4 allows a comparison to be made between the results of expert hand grading and those of the instrument. The samples shown represent a number of lots of commercial pectin which had been standardised as closely as possible to 150 grade by hand grading.

Discussion

In routine testing, only two instead of four glasses of jelly are prepared, since this gives accuracy sufficient for the purpose. If desired, three glasses can be prepared, one being used in the setting-time determination. Then, since the jellies used under the tester are undamaged, they can be cut to determine texture.

Some difficulty may be experienced in turning out the jelly so that it will stand erect on the plate, but with the proper technique a vertical jelly can be assured.

The glass is held in a nearly horizontal position as a spatula is inserted between the top of the jelly and the glass. This causes the jelly to fall away from the

TABLE 3

THE REPRODUCIBILITY OF RESULTS IN REPEATED TESTS ON TWO PECTINS

Pectin.	Assumed Grade.	Per Cent. of Sag. Glass No. 1.	Glass No. 2.	Average.	Indicated Grade from Curve.	Average Indicated Grade.
	150	22·8	22·8	22·8	155	
	150	23·0	22·9	23·0	153	
C	150	22·7	23·0	22·9	154	154
	150	22·8	22·6	22·7	155	
	150	23·1	22·7	22·9	154	
	150	23·0	22·9	23·0	153	
	150	23·3	23·8	23·6	149	
D	150	23·4	23·1	23·3	152	152
	150	22·4	23·4	22·9	154	

TABLE 4

COMPARISON OF RESULTS BY HAND AND TESTER GRADING

Number. Sample	*Hand Grade.*	*Per Cent. of Sag.*			*Grade from Curve.*
		Glass No. 1.	*Glass No. 2.*	*Average.*	
1	150	22·4	22·5	22·5	157
2	150	22·7	22·5	22·6	156
3	150	22·3	22·1	22·2	159
4	150	22·1	22·5	22·3	158
5	150	22·3	22·2	22·3	158
6	150	23·6	23·8	23·7	149
7	150	23·1	23·2	23·2	152
8	150	22·7	22·7	22·7	155
9	150	22·4	22·6	22·5	157
10	150	24·2	24·2	24·2	146
11	150	22·3	22·4	22·3	158
12	150	23·0	23·0	23·0	153
13	150	23·5	23·5	23·5	150
14	150	22·1	22·4	22·3	159
15	150	23·3	23·6	23·5	150

container from the top of the glass to the bottom. Then by rotating the container separation is effected over the entire surface. Finally the jelly glass is inverted over the glass plate, allowing the jelly to slide out. Lockwood and Hayes suggested straightening the jelly by finger pressure if necessary.

The jelly glasses most nearly meeting the requirements of this method are the Hazel Atlas No. 85. These are not ideal because the bottoms are slightly concave and because it is necessary to grind off about $\frac{1}{8}$ inch of glass to obtain the desired depth of 3·125 inches at the centre. After the war it should be possible to obtain more satisfactory glasses or to have plastic containers made with removable bands to serve as "sideboards."

Fig. 1 shows a jelly glass with a strip of gummed paper acting as a "sideboard." The strip is $\frac{3}{4}$ inch wide and extends $\frac{1}{2}$ inch above the rim of the glass. Strips of ordinary paper about 1 inch wide extending $\frac{1}{2}$ inch above the glass and secured by a rubber band have been used satisfactorily.

Enough work has also been done to indicate the utility of the tester in determining the strength of low methoxyl pectin in jellies of no sugar, 35 per cent. sugar, and in jellies with milk.

The points of superiority of the present test method over other methods investigated are these: The jelly surface is not ruptured; the jelly is not strained beyond its elastic limit; jellies of commercial firmness can be tested; the instrument itself is rugged, simple, and is easily made in any machine shop; friction of moving parts is not a factor; and finally, as the data show, the instrument measures jelly firmness accurately and reproducibly.

The tester and method are being used regularly in three laboratories of this organisation and are being tested by two outside laboratories.

In conclusion the authors wish to acknowledge the assistance of others in the Exchange—Dr. G. H. Joseph, Mr. J. L. Baker and Mr. W. E. Baier.

REFERENCE

[1] Lockwood, H. C., and R. S. Hayes, *J. Soc. Chem. Ind.*, **50**, 145T-151T (April 24, 1931).

Descriptive Chemistry of the Wheat Kernel

A UNIVERSITY of Minnesota professor has culminated a lifelong investigation of wheat by the publication of a new book of interest to the milling and baking industries, entitled *The Constituents of Wheat and Wheat Products*, by Clyde H. Bailey, Dean and Director of the Department of Agriculture of the University of Minnesota. The new volume has been issued in the Monograph Series of the American Chemical Society.

Dr. Bailey's latest book concerns itself primarily with the descrjptive chemistry of the wheat kernel, unfolding the complete story of research and discovery and setting forth the knowledge accumulated up to the present. Although he is himself a cereal chemist whose work has earned for him recognition as the world's foremost authority on the chemistry of wheat flour, Dr. Bailey does not confine his book to the research findings of himself and his students. Rather he has tracked down all known reports of investigations into the contents of the wheat kernel and integrated them into the first complete compendium of facts on this subject. His own experience in the field provided an unequalled background for scrutinising more than a thousand articles that had significant bearing on the subject and for welding the information gleaned from these into a coherent presentation of all scientific data available.

Dr. Bailey had ample opportunities of seeing what other workers were doing, as he travelled widely on scientific missions, and visited all the laboratories at home and abroad in which important wheat researches were being carried out.

Besides inviting further research to determine nutritional values contained in the wheat kernel, his analysis touches on many factors that relate to the palatability of wheat products after they are put through various milling and baking processes.

The new volume will be of special interest in the laboratories of the milling and baking industries, where there is an ever-continuing search for better methods of separating the constituents of wheat flour and adding and subtracting to find new combinations that make possible pleasing variations in foods made largely from wheat. Here again Dr. Bailey is in the unique position of having worked closely over a period of years with millers and bakers in setting up laboratories and pointing their research toward improved wheat foods. In 1941 Dr. Bailey served as chairman of a committee of eminent technologists which was chosen to advise the national federation of millers in regard to the enrichment of flour.

Dr. Bailey is the author of a great many bulletins and papers published in scientific journals. These papers range in content over the entire field of cereal chemistry, including fundamental studies in grain storage, grain grading, milling, the storage of milled products, the evaluation of quality of flours, the process of dough fermentation, the effect of individual constituents in the dough batch, physico-chemical factors in flour and bread manufacture, the baking test (including both the test loaf and its commercial applications), the storage of baked products, rancidity of fats and oils used in baked products, methods of analysis of cereals and cereal products, and many others.

Gustation

PART I

R. W. MONCRIEFF, B.Sc., A.R.I.C.

THE multitude of "tastes" we commonly experience are due not only to gustatory sensations, but also to tactile, heat and cold, and, above all, olfactory sensations. The tongue is bountifully supplied not only with taste receptors, but also with touch, heat and cold receptors. If the nose is held, we find how much of "taste" was really odour, and boiled turnips and apples and onions are practically the same. Ham and lamb are indistinguishable, port is like sugar, claret like weak vinegar. Most of the discrimination attributed to the palate is really performed by the olfactory membranes. The ethereal odour of fruits is often designated as taste. On the other hand, the "odour" of chloroform is largely due to stimulation of the sweet taste receptors. Just as one odour can mask another, so in the case of tastes the syrups of orange, cinnamon and sarsaparilla will disguise a salty taste, and raspberry and cocoa will disguise a bitter taste.

Four Main Tastes

The salty and sour tastes seem to be simpler than the sweet or bitter. Taste is a higher differentiation of the common chemical sense, and the elaborate taste receptors show that it is a much later development than the common chemical sense which has free nerve endings. Above the fishes, taste is confined to the mouth. In man it is confined to the dorsal surface of the tongue, the soft palate, the epiglottis and the beginning of the gullet, but in children taste buds are spread over wider areas of the mouth. As evolution has proceeded, taste has been more and more restricted to one locality, and a similar state of affairs is seen in the growth of man from the fœtus, for with increasing age the receptors disappear from all but very localised areas. In children, but not in adults, the centre of the tongue and the inner surfaces of the cheeks are taste-sensitive. As we are descended from sea-inhabiting invertebrates, we should expect the salt taste to be the most primitive, followed by acid taste, which would function chiefly as a warning. These two tastes are more concerned with environment and safety than with food. Later, when bitter and sweet tastes made their appearance, they were concerned with nutrition. We know well that salt and acid tastes are stimulated by special groups of substances—viz., salts and acids—but bitter and sweet tastes are more widespread. Possibly for this reason, or perhaps there may have been confusion between salt and sour tastes on the one hand and chemical irritants on the other, there was in the nineteenth century a reluctance to recognise more than two tastes—sweet and bitter. However, Schiff[1] showed that a solution of acid too weak to affect the general mucous surface would evoke a sour taste in the mouth. A similar observation regarding salt solutions was made by von Vintschgau.[2]

For some time now it has been generally agreed that there are four main tastes—sweet, sour, salt, bitter—and this view has received striking confirmation from the experiments of Allen and Weinberg, to be discussed later in this article.

The Sour Stimulus

The sour substances we commonly encounter all contain acids. There is acetic acid in vinegar, citric acid in oranges and lemons, malic acid in apples, and volatile acids in sour milk. The stimulus for the sour taste is an acid. The feature common to all acids is to ionise an aqueous solution into an anion and a cation, which latter is always the hydrogen ion. The higher the concentration of hydrogen ions in a pure solution, the stronger is its acid character and the more sour the taste. Strong acids are very highly ionised—that is, most of the molecules have dissociated into ions—but not all of them.

$$HCl \rightarrow H^+ + Cl^-.$$

In dilute solutions the degree of dissociation is greater than in concentrated solutions, although the absolute concentration of H^+ ions will be greater in the concentrated than in the dilute solution. Often, however, the degree of dissociation increases so rapidly on dilution that a dilution with an equal volume of water will not seriously reduce the concentration of hydrogen ions. Weak acids are not highly ionised, and their solutions contain a relatively large number of undissociated molecules. The dissociation is expressed

$$CH_3COOH \rightarrow CH_3COO^- + H^+,$$

but only a small proportion of the CH_3COOH molecules are dissociated. The sour taste is generally proportional to the concentration of hydrogen ions. A strong acid such as hydrochloric acid in dilute solution is practically completely ionised, so that the taste must be due either to the H^+ or Cl^- ions. Kahlenberg[3] showed that hydrochloric acid still tastes sour at N/800 concentration, while at this concentration sodium chloride, which is also practically completely ionised,

$$NaCl \rightarrow Na^+ + Cl^-,$$

is tasteless. Hence the taste of the acid is not due to the chlorine ions and must be due to the hydrogen ions. Further, the addition of a salt such as sodium acetate to an acetic acid solution reduces the hydrogen ion concentration and also causes the acid solution to taste less sour.[4] Kahlenberg also noted an anomaly of weak acids. Hydrochloric acid, which can just be tasted in N/800, has four or five times the concentration of H^+ ions found in N/200 acetic acid, which, being a weak acid, is much less dissociated. Nevertheless, N/200 acetic acid just possesses a sour taste. Acetic acid can be tasted when its hydrogen ion concentration is only one-quarter that of just sapid hydrochloric acid.

Harvey[5] prepared buffer solutions of acetic acid and sodium acetate, and compared with several observers the tastes of these solutions with hydrochloric acid solutions. His results showed that the sour taste depends on both the H^+ ion concentration and the total free acid.

Paul[6] showed that acids of nearly the same dissociation constant which would have similar concentrations of H^+ ions, such as acetyllactic and tartaric acids, could have very different tastes. Likewise, isohydric solutions of different acids could have different tastes, and he concluded that the sour taste was due partly to the H^+ ion, but also to the undissociated acid. He also thought that the vapour pressure of the acid exerted an influence.

Liljestrand[7] made experiments with buffer solutions. First, he showed that with pure acids the threshold concentration for the sour taste corresponded to *p*H 3·4 to 3·5 for mineral acids and to *p*H 3·7 to 3·9 for organic acids such as acetic, lactic, citric and butyric acids. If a buffer solution was made, the ionisation would be depressed so that to keep the same *p*H 3·9 more acid had to be added, and such a solution containing more acid and some buffer salt tasted more sour than pure acid of similar *p*H value. In fact, a buffer mixture of acetic acid and sodium acetate just gives a sour taste at *p*H 5·6, which represents a much lower H^+ ion concentration than *p*H 3·9, which is the threshold concentration of pure acid. By using large quantities of buffer salts it was possible to make solutions of nearly neutral *p*H value, which nevertheless had a sour taste. As was to be expected, the pure acids gave the sour taste immediately, the buffer solutions more slowly as ionisation had to proceed on the tongue possibly following absorption or neutralisation by the tongue of the already free H^+ ions. Liljestrand concluded that the sour taste is not due to any definite *p*H value, but rather to the titration capacity of the solution.

Ostwald and Kuhn[8] investigated the problem from the colloidal aspect, and suggested that, while the sour taste was qualitatively determined by the H^+ ion concentration, it was regulated quantitatively by the swelling of the colloidal tissues of the tongue and mouth, and the swelling was not directly determined by H^+ ion concentration. They also found that solutions of acids containing buffer salts were more sour than solutions of the pure acids of similar *p*H value.

Rosenbaum[9] ascribed the strong, sour tastes of solutions of weak acids which were poor in H^+ ions to a peculiar ability of such weak acids readily to penetrate the organs of taste.

Bacharach[10] found the threshold concentrations for different buffered solutions. Some of these were:

Na_2HPO_4 and NaH_2PO_4	... ...	*p*H 6·4
K_2HPO_4 and NaH_2PO_4	... ...	,, 6·2
CH_3COOH and $CH_3COO\,Na$	...	,, 5·9
CH_3COOH and $CH_3COO\,K$	... ...	,, 5·6
CH_3COOH and $(CH_3COO)_2Mg$	...	,, 5·3

He concluded that the sour taste arises at different *p*H values and depends on both the concentration of H^+ ions and the total concentration of the solution.

Baráth and Vandrfy[11] made a comparison of the tastes of equimolar solutions of acetic and hydrochloric acids. The more dissociated acid was the stronger, but at very great dilutions—less than 0·01 N.—the acetic acid might give a stronger taste than the hydrochloric acid.

The subject was also investigated by Dietzel,[12] who concluded that the sour taste was not quantitatively proportional to the strength of the acid, although the two run more or less parallel. Other factors, such as surface tension, vapour pressure and swelling of the tissues by the acid, came into play.

Berlatzky and Guevara[13] confirmed that the threshold of sour taste for different acids corresponded to different *p*H values, and that the anion as well as the H^+ ion played a part in determining the taste.

Taylor[14] measured the threshold concentrations and the *p*H values, at those concentrations, of nine different organic acids. He assumed that a given degree of sourness was due to a definite H^+ ion concentration within the taste bud. This was a new departure and offered a chance of reconciling the logical view that taste and H^+ ion concentration would be proportional, with the anomalous experimental results obtained. The relative concentration of undissociated acid also inside the taste-bud may then be calculated from the dissociation constants of the acids. The ratio

$$\frac{\textit{undissociated acid outside taste-bud}}{\textit{undissociated acid inside taste-bud}}$$

is the relative gradient necessary to cause penetration of the acid into the tissues. Polar groups such as $-OH$, $-Cl$, and $-Br$ introduced into an acid reduce its ability to penetrate the tissues. In a later paper Taylor, Farthing and Berman[15] showed that the addition of a polar grouping such as $-OH$, $>C=C<$, $>C=O$, $-COOH$ or NH_2 to an organic acid made its penetration to the receptor from 20 to 500 times more difficult, but that the lengthening of the carbon chain in the acid by the introduction of additional methylene groups had the reverse effect. These results pointed to the tissue which absorbed the acids being fatty rather than protein.

Cragg[16] has reported that at the threshold for the sour taste the *p*H value of the following acids is between 4·2 and 4·6: hydrochloric, sulphuric, nitric, monochloracetic, acetic, formic and tartaric acids. Further, the addition of 3 per cent. sugar or of saccharine equal in sweetness to this causes no change in the *p*H value of hydrochloric acid, but reduces its sourness by 15 per cent.

Kenrick[17] found that the proportion of buffer salt (phosphate) necessary to bring different acids to a *p*H value of 5 was proportional to the sourness of the various acids alone. A strong acid like hydrochloric would require much more buffer salt to reduce its hydrogen ion concentration to *p*H 5 than would a weak and relatively undissociated organic acid. Kenrick found also that the threshold concentrations for sour taste were lowered—*i.e.*, the sensitivity to sour taste was enhanced by the presence of bitter or astringent substances such as quinine and tannin. He also noted that sourness was an immediate sensation connected with the taste-buds and did not depend on the action of saliva secretions.

The evidence is that the sour taste is mainly but not entirely dependent on the hydrogen ion. The anion and the undissociated molecules also play a part. Mineral acids such as nitric and hydrochloric cannot be distinguished from each other by taste, and in these cases it appears to be a simple question of the hydrogen ion concentration controlling the sour taste; but organic acids like acetic, tartaric and citric acids have distinctive tastes and are more sour than they should be if it was simply a question of hydrogen ion concentration. The anomalous sourness of these weak organic acids may be due to the undissociated molecules, which act as a reserve and dissociate to give

fresh ions as fast as they are used up; but if this is the case, it is not clear why acetic acid and hydrochloric acids should not be equally sour *in equal molar concentrations*, as the initial degree of ionisation would not appear to be very important if the undissociated molecules could ionise as required to give replacement ions. In fact, hydrochloric acid is much more sour than an equimolar solution of acetic acid except at great dilutions. It has also been suggested that penetration of the tongue surface may be a factor, but penetration can be observed by using natural indicators, and it is a slow process, whilst taste is a quick reaction. As acetic acid is a much better solvent for fatty substances than the mineral acids, this may have some bearing on the point. Water-solubility alone is necessary to give the sour taste, but if it is accompanied by lipoid solubility more general access to the receptors is possible with correspondingly more acute sensation. In the case of citric acid it is possible that the sweet taste enhances the sour sensation.

The Salt Stimulus

The typical salt taste is that of common salt, sodium chloride. Also the chlorides of potassium, ammonium and calcium all taste similar to sodium chloride. Hence one would say the anion Cl^- and the cation Na^+, K^+, NH_4^+ or Ca^{++} was responsible for the taste. Kahlenberg[18] showed that, while sodium chloride solution was distinctly saline at ·04 molar, a similar solution of sodium acetate was not saline; hence the saline taste must be due to the Cl^- ion and not to the Na^+ ions, but in this connection it must not be forgotten that the sodium chloride would be more completely dissociated than the sodium acetate, and that the concentration of Na^+ ions in the sodium chloride solution would be greater than in the sodium acetate solution. Now, sodium bromide and sodium iodide are also salty, but potassium iodide is bitter as well as salty. However, it is clear that the Cl^-, Br^- and I^- ions often give a saline taste. The sulphates and nitrates of sodium and potassium are also salty. While the anion Cl^-, Br^-, SO_4^{--} or NO_3^- seems to be effective in producing the saline taste, yet the cation also has an effect, otherwise all chlorides would taste the same. Similarly, the cation has a specific effect, since all salts of sodium do not taste the same.

Gayda[19] concluded that the taste of salts was a function of both the anion and cation, but that potassium salts were exceptional, as their salty taste was more pronounced than predicted by rule.

On the other hand, Stooff,[20] who investigated the taste of drinking water, reported that the K^+ ion was the most difficult to detect by taste, whilst iron was the easiest cation to detect. Sodium was detected before potassium, magnesium before calcium, and iron before manganese. The ammonium ion was easily distinguished in the presence of others. Of the anions, the hydroxyl ion OH^- is the first to be noticed, and this is followed in order by NO_3^-, Cl^-, HCO_3^- and SO_4^{--}. Potash (KOH) was noted before soda (NaOH), which was rather strange, as the Na^+ ion was usually detected before the K^+ ion. Iron and manganese salts were detectable in a concentration of 1 in 50,000, and other salts and hydroxides required higher concentrations. Free carbon-dioxide in quantities over 100 mg. per litre had such a strong influence on the taste that small quantities of salts were not noticed when this was present. Stooff also reported that ethyl alcohol was recognised at a dilution of 1 in 50,000, but this must have been by odour and not by taste, as relatively high concentrations about 13 per cent. of ethyl alcohol can only just be tasted. He also noted that water did not have the same taste in all parts of the mouth, and it is well known that if a substance has two tastes—say, sweet and bitter—then it tastes sweet at the tip of the tongue and bitter at the back of the tongue.

Kionka and Strätz[21] compared normal solutions of eighteen different salts and divided them into three groups.

(1) Those with a dominating salty taste—viz., NaCl, KCl, NH_4Cl, LiCl, RbCl, NaBr, NH_4Br, LiBr, NaI, LiI.

(2) Those with both salty and bitter tastes—viz., KBr, NH_4I.

(3) Those with a dominating bitter taste—viz., CsCl, RbBr, CsBr, KI, RbI, CsI.

With the exception of cæsium chloride, the chlorides were all salty. Of the six iodides, three were bitter, two salty and one intermediate. The four salts with the highest molecular weight—RbI, CsI, KI, RbBr—were decidedly bitter. The eight salts with the lowest molecular weight had a predominant salty taste, with the exception again of cæsium chloride. They concluded that the taste of a salt depends on the cation Na^+, K^+, Rb^+ or Cs^+, etc., which determines the intensity, and upon the anion Cl^-, Br^-, I^-, etc., which gives the character.

Maybee[22] notes that compounds of lithium and sodium are salty, of potassium are salty and bitter, and of rubidium are very bitter. Likewise, chlorides, thiocyanates and acetates are usually salty, bromides slightly bitter, and iodides definitely bitter. It will be seen, therefore, that there is a general rule that the low molecular weight salts are salty, whilst the high molecular weight salts are bitter. Very probably in all cases more than one set of receptors are acted on, even a dominating salty compound having some effect on the sour, sweet and particularly the bitter receptors, and with increase in molecular weight the dominant note shifts from the salt to the bitter receptors. The main salt taste appears to be due to the free anions. The possibility of the unionised material playing a part cannot be ruled out.

Richter and MacLean[23] worked on fifty-three human adults and found that salt solution could be distinguished from distilled water at a concentration of ·016 per cent. and sometimes as low as ·007 per cent., and that the saline taste could be recognised at ·087 per cent. and sometimes at ·02 per cent. Richter[24] showed that the salt taste threshold of twenty normal rats averaged ·055 per cent., about the same as in man, but that the removal of the adrenals from eight rats reduced their salt taste threshold to ·003 per cent.—*i.e.*, the sensitivity was increased nearly twentyfold. The adrenalectomised rats showed a craving for salt even when offered in amounts unlikely to have any beneficial effect, and this appeared to be due to chemical changes in the taste mechanism in the oral cavity, which resulted in an enhanced salt discrimination.

The salt taste, together with the bitter, is diminished by rise in temperature—*i.e.*, a cold salt solution tastes more salty than when warm. The acid and sweet tastes are, conversely, enhanced by rise in temperature.[25]

(*Continued on page 214*)

Combined Efforts in Food Production

MANUFACTURE by processing and dehydration of a large range of foods is to-day's outstanding innovation in the production for use by many nations of the means to meet not only war-time but post-war needs. In the United States these efforts to make the best use of the earth's products, after being first brought together in their natural condition, have given the word " combined " unusual publicity. For example, there are :

The Combined Production and Resources Board.
The Combined Raw Materials Board.
The Combined Food Board.
The Combined Shipping Adjustment Board.
The Combined Chiefs of Boards.

Planning by " combining " is thus the new feature in food production, manufacture, packaging or otherwise, and distribution. This does not apply solely to American products. These Boards are connected with the war and post-war conditions of the United Nations and are acting jointly, mainly under the management of the U.N.R.R.A. The Combined Food Board, for instance, consists of three member countries—the United States, United Kingdom and Canada. Its purpose is to provide a common forum in which the member nations may discuss problems of general interest on the food front and to develop mutually acceptable recommendations respecting allocation, production, procurement, and manufacture when needed, and international distribution of available food supplies. The recommendations are then presented to the different governments concerned. The Board provides authorities and operating officials of the member governments with programmes in which all possible differences of opinion have been reconciled. It co-operates with the London Food Council (which includes as members the various parts of the British Commonwealth), and other combined boards and food planning agencies. It also encourages the preparation by manufacturing processes of foods which can be reduced to the least possible bulk.

The Combined Food Board has three operating divisions—Commodity Committees, Executive Officers, and Board Members. The committees deal with problems relating to such natural and manufactured foods as meat and meat products, fats and oils, sugar, tobacco, cereals and feeds, rice, beans, peas, seeds, dairy products, poultry products, fruits and vegetables, fishery products, coffee, cocoa, spices, fertiliser (joint with Combined Raw Materials Board), agricultural and food machinery (joint with Combined Production and Resources Board), tea (in London), and United Kingdom agricultural production, also in London. Provision is made to establish committees to deal with other foods for Allied products of less importance but which require attention as occasions demand.

Each committee consists of one representative from the several member countries except the Committee on Fishery Products, in which Newfoundland is included, and the Committee on Cereals, which includes Australia. Technical experts and observers from other Allied countries and agencies are also invited to committee meetings so that all relevant data and advice may be presented for discussion, food manufacturing processes now covering so wide a field.

The principal work of a commodity committee is to appraise the over-all position respecting the commodity assigned to it. These committees assemble all the pertinent data respecting requirements of countries requesting supplies, stock positions in all countries, production and manufacture, and forecasts quantities likely to be available. In the light of all such information, each committee recommends supplies and keeps the Board informed of the ever-increasing trend towards concentrated foods prepared by manufacturing plants.

The Secretariat of the Combined Food Board directs the work of the commodity committees. The chief business of executives is not only to carry out instructions and co-ordinate action in respect of each product, but to see that the interests of the food people on the Board are harmonised with the interests of the various governments other than those concerned with food, such as those in charge of shipping, finance, foreign policy, etc.

The Combined Board is particularly concerned with those matters in which unco-ordinated action is likely to cause embarrassment; for example, in the allocation of commodities in short supply there must be agreement as to their division. It may be said with some truth that there is a supply of wheat in the world to take care of United Nations' needs at the present time. Unfortunately, wheat or any other food product is of little value to those who need it unless it exists where it can be utilised by being milled into flour and manufactured into bread and other flour products. Thus the problems of strategic supply and transport have to be considered. Again, it may appear to those unacquainted with the position that there is more than enough sugar for the United Nations. But demands for human consumption, among them the manufacture of sweets, are only a part of the total requirements, so the problem of sugar for manufacture of industrial alcohol is taken into the account. Thus the plans of the food manufacturers and war production authorities have to be dovetailed as far as is practicable.

In the near future more and more enemy-occupied countries being liberated, requirements of foodstuffs, processed and otherwise, as well as other materials, will reach very high figures. It is also the business of the Combined Food Board to establish how the needs of those countries, as well as of Allied countries, can be met during the war and therefore to recommend the necessary procedures.

For efficiency, as well as security, it has been found essential that membership of the several Boards be limited. The three governments represented on the Combined Food Boards have a joint responsibility in planning and to permit liberated countries to be organised and rehabilitated so they may fend for themselves. But since the Board has power only to deal with such natural and manufactured foods as are available, and to advise with respect to requirements, it is in no sense an instrument whereby member governments dictate policies to the United Nations. It plans and secures efficient combined efforts.

The Estimation of the Degree of Concentration of Citrus Juices*

J. H. BARRETT, A. W. E. DOWNER, B.Sc, Ph.D., A.R.I.C. and I. STERN, B.Sc., F.R.I.C.

THE Citrus Fruit Juices Control issued to the industry a pamphlet dated December 1, 1941, containing a table (Table 1) relating specific gravity to concentration ratio of citrus juices to be used for estimating the natural juice equivalent of concentrated juices. Some relationship of this kind must be adopted, but in practice a considerable number of difficulties have arisen. A buyer of juice must retain the right of checking the concentration ratio claimed on the invoice by the seller. Disputes between the two parties often occurred, and the loss of time in reaching settlement caused much inconvenience. The Panel of Chemists was requested to examine the whole problem.

TABLE 1

THE ORIGINAL SP. GR./DEGREE OF CONCENTRATION TABLE

Where the respective Specific Gravities are not in excess of:			*The Ratios of Concentration which* MUST *be adopted are:*
Lemon.	*Orange.*	*Grapefruit.*	
1·080	1·100	1·090	2
1·100	1·125	1·110	2½
1·120	1·150	1·130	3
1·135	1·175	1·155	3½
1·150	1·200	1·180	4
1·170	1·225	1·200	4½
1·190	1·250	1·220	5
1·210	1·275	1·240	5½
1·230	1·300	1·260	6
1·245	1·325	1·280	6½
1·260	1·350	1·300	7
1·280	1·370	1·325	7½
1·300	1·390	1·350	8
1·320	1·415	1·370	8½
1·340	1·440	1·390	9
1·360	1·465	1·410	9½
1·380	1·490	1·430	10

Table 1 was issued for evaluating concentrated juices in terms of natural juices for the purpose of assessing imports during a datum period. For this purpose it was entirely satisfactory, but when it came into general use as the means of estimating the degree of concentration of concentrated juices defects became apparent. The instructions for using it were unsuitable, no temperature was specified for the sp. gr. determination and the subdivision into only half-degrees of concentration had the effect in a case of dispute of placing a considerable amount of money at stake. Subdivisions of quarter-degrees of concentration were obviously desirable and a new table embodying these improvements was produced. Regarding the disputes over sp. gr. values, the most obvious cause was that the method of determination was not specified. It was known that several different methods were used, including one based on refractive index measurement, and the hydrometer method had been applied even in cases of viscous juices. A reliable method for general use was obviously needed.

* Report from the Panel of Chemists of the Citrus Fruit Juices Control.

Determination of Sp. Gr. of Concentrated Juices

The determination of the sp. gr. of concentrated juices has been fully investigated and the procedure which follows yields results which are both accurate and reproducible. It has, however, the disadvantage of being tedious and an alternative method based on the use of the Abbe refractometer has been developed. This method is simple and rapid and gives results which are nearly always in agreement with the sp. gr. method. While the sp. gr. method remains the official procedure and only results obtained by its use will be considered in cases of dispute, the refractometric method is strongly recommended for routine purposes.

It is necessary to exercise great care in sampling casks of highly concentrated juices, as occasionally the contents of such casks are not homogeneous and adequate mixing may be virtually impossible. Should a dispute arise concerning the sp. gr. or refractive index of a cask of juice, agreement may be reached by taking a further sample under conditions satisfactory to both parties, both of whom will carry out determinations on this same sample.

The Refractometric Method

Owing to the natural variation in composition of citrus fruit juices, the use of either sp. gr. or refractive index as an index of degree of concentration is necessarily somewhat empirical. Since, however, the official sp. gr./concentration table was already in use, it was essential to ensure the minimum of dislocation by basing the refractive index table on the existing table.

Stevens and Baier[1] have shown that the refractive index of a citrus juice can be used to calculate the sp. gr. by reference to tables relating refractive index, degrees Brix and sp. gr. of sucrose solutions. The figure so obtained required correction because of the presence of non-sucrose substances. They state that the greatest single variation is caused by citric acid and that this is the only factor which need be considered, the effect of the other constituents being relatively small. They give a table of corrections for the effect of citric acid.

The need to determine the acidity as well as the refractive index of the sample is an obvious disadvantage for routine testing. Hence an average figure was taken for the acidity of each variety of juice at natural strength—viz., Lemon, 6·6 per cent. W/V; Orange, 1·4 per cent. W/V; and Grapefruit, 1·5 per cent. W/V, expressed as $C_3H_4(OH)(COOH)_3.H_2O$. The correspond-

ing acidity was calculated for each stage of concentration in Table 1. The sp. gr. at each stage of concentration was used to evaluate the refractive index as indicated above, and a correction was applied for the corresponding average acidity. Refractive index was plotted against the corresponding sp. gr., and for each variety of juice the result was practically a straight line.

The sp. gr. and refractive index were then determined on a large number of samples of concentrated juices, and the results plotted on the respective graphs that had been constructed from calculated refractive indices. For lemon juice the two sets of values fell almost exactly on the same straight line, and for grapefruit juice the agreement was very nearly as good. There was rather more deviation with orange juice, the values obtained by means of the refractometer giving a slight curve.

It was necessary that the degree of concentration as determined by refractive index should correspond as closely as possible with the figure obtained from the specific gravity. For this reason the curves obtained by plotting the figures actually obtained on commercial samples of concentrated juices were used as a basis for drawing up tables relating refractive index and degree of concentration. The opportunity was taken of incorporating quarter-degrees of concentration.

TABLE 2

THE REFRACTIVE INDEX/DEGREE OF CONCENTRATION RELATIONSHIP AS NOW ADOPTED BY THE CITRUS JUICE CONTROL

When Refractive Index at 20° C. falls between (inclusively):			*The Degree of Concentration is:*
Lemon.	*Orange.*	*Grapefruit.*	
1·3681-1·3710	1·3816-1·3860	1·3756-1·3790	3
1·3711-1·3740	1·3861-1·3905	1·3791-1·3835	3¼
1·3741-1·3770	1·3906-1·3950	1·3836-1·3880	3½
1·3771-1·3795	1·3951-1·3995	1·3881-1·3925	3¾
1·3796-1·3820	1·3996-1·4040	1·3926-1·3970	4
1·3821-1·3850	1·4041-1·4085	1·3971-1·4010	4¼
1·3851-1·3880	1·4086-1·4130	1·4011-1·4050	4½
1·3881-1·3910	1·4131-1·4180	1·4051-1·4085	4¾
1·3911-1·3940	1·4181-1·4230	1·4086-1·4120	5
1·3941-1·3975	1·4231-1·4280	1·4121-1·4160	5¼
1·3976-1·4010	1·4281-1·4330	1·4161-1·4200	5½
1·4011-1·4040	1·4331-1·4380	1·4201-1·4235	5¾
1·4041-1·4070	1·4381-1·4430	1·4236-1·4270	6
1·4071-1·4095	1·4431-1·4475	1·4271-1·4310	6¼
1·4096-1·4120	1·4476-1·4520	1·4311-1·4350	6½
1·4121-1·4148	1·4521-1·4565	1·4351-1·4390	6¾
1·4149-1·4175	1·4566-1·4610	1·4391-1·4430	7
1·4176-1·4208	1·4611-1·4650	1·4431-1·4475	7¼
1·4209-1·4240	1·4651-1·4690	1·4476-1·4520	7½
1·4241-1·4270	1·4691-1·4735	1·4521-1·4565	7¾
1·4271-1·4300	1·4736-1·4780	1·4566-1·4610	8

Collaborative tests (Table 3) show the good agreement between the refractive index results obtained by independent analysts. This easy method would be admirably suited for adoption as the standard procedure if it was known that all juice users possessed the necessary instrument.

Following the publication of Table 2 by Citrus Fruit Juices Control in a pamphlet dated July 9, 1943, many samples of juice have been tested by both methods and the results are summarised in Table 4.

TABLE 3

THE REFRACTIVE INDEX OF CONCENTRATED CITRUS JUICE AT 20° C.

Sample.	*Analyst.*		
	1.	2.	3.
1. Conc. orange juice	1·4567	1·4564	1·4560
2. Conc. orange juice	1·4506	1·4503	1·4510
3. Conc. lemon juice	1·4012	1·4016	1·4017
4. Conc. lemon juice	1·4035	1·4040	1·4040
5. Conc. grapefruit juice ..	1·3870	1·3867	1·3868
6. Conc. grapefruit juice ..	1·4430	1·4434	1·4432
7. Conc. grapefruit juice ..	1·4435	1·4440	1·4440

TABLE 4

SUMMARY OF RESULTS, SHOWING SATISFACTORY AGREEMENT BETWEEN DEGREE OF CONCENTRATION AS ESTIMATED BY THE SP. GR. AND REFRACTOMETRIC METHOD

Kind of Juice.	*Lemon.*	*Orange.*	*Grapefruit.*
Total No. of samples ..	76	121	92
No. of samples giving same concentration by both methods	72	114	80
No. giving ¼ degree higher concentration by R.I. ..	4	6	7
No. giving ¼ degree lower concentration by R.I. ..	0	1	5

In border-line cases agreement was considered to have been obtained if the deviations from the limiting values were within experimental error—*i.e.*, 0·002 for sp. gr. and 0·0005 for refractive index.

The Specific Gravity Method

The original Sp. Gr./Degree of Concentration table was redrafted (see Table 5) to include subdivisions of quarter-degrees of concentration, the sp. gr. values being determined at 20°/20° C.

TABLE 5

THE SP. GR./DEGREE OF CONCENTRATION RELATIONSHIP AS NOW ADOPTED BY THE CITRUS JUICE CONTROL

When Sp. Gr. at 20°/20° C. falls between (inclusively):			*The Degree of Concentration is:*
Lemon.	*Orange.*	*Grapefruit.*	
1·111-1·120	1·139-1·150	1·121-1·130	3
1·121-1·128	1·151-1·163	1·131-1·143	3¼
1·129-1·135	1·164-1·175	1·144-1·155	3½
1·136-1·143	1·176-1·188	1·156-1·168	3¾
1·144-1·150	1·189-1·200	1·169-1·180	4
1·151-1·160	1·201-1·213	1·181-1·190	4¼
1·161-1·170	1·214-1·225	1·191-1·200	4½
1·171-1·180	1·226-1·238	1·201-1·210	4¾
1·181-1·190	1·239-1·250	1·211-1·220	5
1·191-1·200	1·251-1·263	1·221-1·230	5¼
1·201-1·210	1·264-1·275	1·231-1·240	5½
1·211-1·220	1·276-1·288	1·241-1·250	5¾
1·221-1·230	1·289-1·300	1·251-1·260	6
1·231-1·238	1·301-1·313	1·261-1·270	6¼
1·239-1·245	1·314-1·325	1·271-1·280	6½
1·246-1·253	1·326-1·338	1·281-1·290	6¾
1·254-1·260	1·339-1·350	1·291-1·300	7
1·261-1·270	1·351-1·360	1·301-1·313	7¼
1·271-1·280	1·361-1·370	1·314-1·325	7½
1·281-1·290	1·371-1·380	1·326-1·338	7¾
1·291-1·300	1·381-1·390	1·339-1·350	8

To illustrate the unsatisfactory situation that existed at the outset of this investigation, the sp. gr. of a number of samples of concentrated juices were determined by different analysts, each applying his own method. The results are shown in Table 6.

TABLE 6

THE SP. GR. OF CITRUS JUICES AS DETERMINED BY DIFFERENT ANALYSTS USING THEIR OWN TECHNIQUES

Variety.	*Specific Gravity.*			
	1.	2.	3.	4.
Lease-Lend lemon ..	1·207	1·207	1·206	1·216
Palestine lemon ..	1·132	1·133	1·134	1·133
Palestine orange ..	1·161	1·161	1·161	1·165
Californian orange ..	1·2195	1·219	1·221	1·233
S. African orange ..	1·212	1·233	1·236	1·245
S. African grapefruit	1·153	1·163	1·153	1·168
Lease-Lend lemon ..	1·275	1·296	1·283	1·300
Palestine grapefruit ..	1·1515	1·153	1·154	1·156

It is seen that there was good agreement on some samples, but with others large variations were obtained. In all cases a sp. gr. bottle method had been used, but sometimes the juice was weighed direct, sometimes after dilution with water. It was highly probable that the variations in the results were due to the different methods employed.

Filling the sp. gr. bottle with juice and weighing in the normal way, the "direct method", gives fairly accurate results on some types of juice. The chief error in this method is due to the inclusion of air bubbles, but where the juice is fluid and the cellular matter is finely divided very few air bubbles are present, and it may therefore be assumed that the results are accurate. However, many types of concentrated juices are viscous and obviously contain much entrained air; with them results obtained by the "direct" method must be low.

If the juice is first accurately diluted to such an extent that all air bubbles are liberated and from the sp. gr. of the diluted juice that of the original is calculated, the result obtained is unaffected by error due to air bubbles.

Thus the "dilution" method yields higher results than the "direct" method, but they are not true values because of the volume contraction which occurs on dilution. The higher the dilution, the larger is the error due to volume contraction and the higher the final sp. gr. result.

An approximate correction can be derived from the accurate data available for the sp. gr. of sucrose solutions, the assumption being made that solutions of the non-sucrose solids show the same relationship of sp. gr./per cent. composition as does sucrose. This relation was plotted from published data for citric acid, dextrose and lævulose, by far the most important of the solutes in question, and the graphs were found to be closely related to that of sucrose. The degree of accuracy thus obtained is sufficiently high, taking into consideration the arbitrary nature of Table 5.

Table 7 shows results obtained on varying the degree of dilution in the dilution method and the effect of applying a "Brix correction" in the calculation. The results obtained by the "direct" method are also given for comparison. The "Brix correction" is applied as follows: Dilute the concentrate accurately by weight and determine the sp. gr. (S) of the dilution; in Domke's table[2] of apparent sp. gr. of sucrose solutions at 20°/20° C., find the Brix value corresponding to S and multiply it by the ratio in which the original juice was diluted; thus the Brix value of the original juice is obtained and the corresponding sp. gr. can be read off from Domke's table.

The uncorrected values increase rapidly as the dilution increases, but the corrected values increase at a lower rate. That they do increase at all, despite the fact that with increasing dilution the error due to bubbles decreases and falls eventually to zero, indicates that the "Brix correction" does not entirely correct for the volume contraction on dilution.

TABLE 7

THE EFFECT OF VARYING THE DEGREE OF DILUTION IN THE "DILUTION METHOD" AND OF APPLYING THE "BRIX CORRECTION"

Sample.	*Sp. Gr. at 20°/20° C. by the "Direct" Method.*	*The "Dilution" Method.*		
		Dilution Ratio.*	*Sp. Gr. at 20°/20° C. With Brix Corr.*	*Sp. Gr. at 20°/20° C. Without Brix Corr.*
1. Conc. lemon juice	1·2010	1·43	1·2010	1·2030
		1·94	1·2022	1·2055
		2·79	1·2045	1·2080
2. Conc. orange juice	1·2107	1·77	1·2144	1·2174
		1·79	1·2144	1·2174
		2·64	1·2155	1·2195
		5·13	1·2157	1·2208
3. Conc. orange juice	1·2861	1·62	1·3080	1·3151
		1·94	1·3084	1·3171
		2·63	1·3126	1·3234
		4·08	1·3140	1·3266
		4·93	1·3131	1·3266
4. Conc. grapefruit juice	1·1457	1·50	1·1459	1·1462
		2·00	1·1463	1·1476
		3·00	1·1467	1·1485
		4·00	1·1506	1·1525

* $\frac{\text{Weight of juice} + \text{weight of water.}}{\text{Weight of juice.}}$

The procedure of the official method of determining sp. gr. is therefore as follows: Weigh out accurately a suitable quantity of the concentrated juice in a conical flask; add distilled water from a measuring cylinder equal to approximately three times the weight of juice taken, and re-weigh. Close the flask with a rubber bung, mix the contents thoroughly, and allow to stand for one hour. Then determine sp. gr. of the diluted juice by the sp. gr. bottle method at 20°/20° C. in the usual way. When filling the sp. gr. bottle, swirl the juice frequently to ensure that the correct proportion of cellular material enters the bottle. In calculating the result, use the Brix correction as described above.

The reliability of this procedure is shown in the following collaborative tests. Table 8 contains the results obtained by different workers applying the official method to portions of the same sample of juice.

TABLE 8

SP. GR. RESULTS OBTAINED BY DIFFERENT ANALYSTS APPLYING THE OFFICIAL PROCEDURE

Analyst.	*Conc. Orange. Samples of*		*Conc. Lemon. Samples of*		*Conc. Grapefruit. Samples of*	
	1.	2.	1.	2.	1.	2.
1.	1·3400	1·3257	1·2094	1·2177	1·3097	1·3078
2.	1·3410	1·3237	1·2087	1·2152	1·3087	1·3086
3.	1·3396	1·3231	1·2096	1·2175	1·3101	1·3068
4.	1·3388	1·3240	1·2093	1·2162	1·3113	1·3086

Individual analysts can invariably reproduce their own results within the limits of ±0·001 in the final answer.

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Manuring and Grain Quality

THE QUESTION whether there is any relationship between the type of manure used in the field and the quality of the ensuing crop is one that has never been satisfactorily investigated. As is usually the case when a matter has not been experimentally decided, there are only "schools of belief," ranging from the semi-mystical anthroposophists and the out-and-out believers in compost—who proclaim what is almost a religion and is certainly a matter of pure faith—to the scientists who have indecisively investigated some aspect of the question: usually the presence of some easily determined vitamin. In view of the practical importance of the subject from the points of view of marketing and nutrition, it is indeed strange that no worth-while attempt has been made to tackle the problem as a whole.

The vitamin B_1 content of wheats from the famous experimental field of Broadbalk at Rothamsted does not appear to have suffered from long treatment of the soil with artificials, but after about ninety years of continuous wheat-growing the baking quality of the grain from most of the plots seems to have suffered badly without there being any relation to the kind of manure used. These facts are, however, but a slight contribution to the controversy about "natural" *versus* artificial fertilisers, which will presumably endure until the matter is probed on proper lines satisfactory to the scientist. Whether any such demonstration will satisfy the mystics is another question.

Effects on Acidity and Buffer Action

In *Abstracts of the Journal of the Agricultural Association of China*, No. 175, April, 1943, pp. 64-68, Teng-Yi Lo and Chi-Hua Wu have compared the effects of two organic manures on the acidity and buffer action of wheat flour. They used rapeseed cake and cow manure, and found some relationships between the kind of manure and the acidity and buffering ability of the flour. The buffering effect of wheat samples grown with rapeseed cake was greater than that of wheat receiving cow manure. It appeared also that there was a correlation between the rate of application of these manures with the hydrogen-ion concentration and titratable acidity of wheat flour. The results show a decrease in the *p*H value of the flour with increasing rates of application of manure; and a relatively large application of manure was followed by an increase in the titratable acidity of the flour. The authors suggest that correlations may exist between the titratable acidity of flour and the type of manure used, for the titratable acidity of the samples grown with rapeseed cake was higher than that of the samples which received cow manure. They found an appreciable range of variation in acidity and buffer action of one variety of wheat grown under different conditions of soil and fertility.

The last available issue of the Scientific Reports of the Imperial Agricultural Research Institute, New Delhi, mentions on page 21 that studies have been made of the phosphorus fractions in wheat and peas grown with different manures. "A greater part of the phosphorus is in the form of phytin, which is said to be almost unavailable in so far as human nutrition goes. When grown with mineral phosphates only, nearly 50 per cent. of the phosphorus in the grain is in the form of phytin. With organic manures, singly or in combination with mineral phosphate manures, the phytin content of the grain is much less and is of the order of 25 per cent." The name of the worker responsible for this finding is not given, and there does not seem to be any further reference to this work. If it is confirmed it would seem to mark a definite step forward in the understanding of the relationships between crop production and the obscurer aspects of human and animal nutrition.

Food Habits

IT HAS been said of Brillat-Savarin that, as Walton's Angler has made many of its readers turn fishermen, so his *Physiologie de Gout* has converted a fair proportion of the reading public into gastronomers. His life study was gastronomy. It is related of him that while in America, returning from a shooting expedition in the course of which he had killed a wild turkey, he fell into conversation with Jefferson, who began to tell him some interesting anecdotes about Washington and the war. Observing his hearer's distracted air, the statesman was about to leave when the Frenchman, recovering himself, begged a thousand pardons for his inattention. "I was thinking," said he, "how I should dress my wild turkey."

The author of a recent book* on food habits has been acclaimed by his publishers as having "all the characteristics of a new Brillat-Savarin." This is perhaps unfortunate, as it places the book on a special level for criticism, especially on the part of those for whom *Physiologie de Gout* is a bedside book.

The book is mainly concerned with the necessity for the application of the "new science of physiology of the senses." Its 255 pages are crammed with details concerning the repercussion of food on the senses, and in them are quoted a host of writers, from Freud to André Simon. It is mainly by this "science of the senses" (it is stated) "that the author hopes to influence the whole attitude of the specialists towards dietetics."

The author's style may be gathered from an excerpt from the chapter on physiological fatigue, which he suggests is "a point about which the layman knows nothing and to which the dietitian pays no attention." It means that

> the nerves transmitting sensations to the brain fail to respond to a stimulus as they normally do. For instance, after standing for a while in a cheese shop we lose our faculty for perceiving the smell which assailed our nostrils when we entered the shop. When the smell of a dish of food under our noses is found to change or diminish, we must not blame the dish, but ourselves. The author concludes that "the odour of dishes must be foolproof, in view of our unreliable sense of smell."

Apparently he means that dishes must be so compounded that the pleasant odours which are not liable to be affected by fatigue should predominate, different substances acting in a different way as far as fatigue is concerned. Rather a tall order for the *chef*, one would imagine. The British joint and two vegetables, it is pleasing to read, tends towards the avoidance of fatigue. One does not smell it as a whole, but "each one of the three is lifted separately to the mouth, thus creating a contrast which avoids fatigue."

At times the author abandons physiology for psychology. He discusses "the psychology of feelings and other psychological approaches to food." Characteristic of his methods is the description of the gesture which is popularly called "the poor man's grace" in this country—the little push that people give to their empty plate, which we are told is common to all nations and peoples of all ages. "The bowl of food has lost its challenging character and so receives a contemptuous push. It is this definite gesture of rejection that makes the action so significant. We can now say that the tension has been removed and reaction has set in." The warning is added that "it is certainly not good table manners."

Mr. Renner considers that the attempt to probe the secrets of human nutrition by using methods and discoveries of psycho-analysis is justified. It seems to him possible to find a meaning—*i.e.*, an origin—for certain habits of nutrition, general and individual, which cannot be discovered through the medium of other methods described in his book. However, the problem of unaccustomed sensations tends to throw out results, and the author concludes his chapter on Freud and nutrition with the statement that "when the food in New York does not suit a Southerner, it would be fruitless to seek the cause of these individual differences by aid of psycho-analysis."

In another chapter the established sequence of meal courses is discussed. Among such topics as the position of soups in a meal figures dietetic explanations of buttered bread. In some parts of his book the author has an irritating habit of leaving the reader in the air. Torrents of conflicting evidence are poured out with little attempt to weigh it or sum it up. This produces, in the reviewer at least, the sensation of indigestion, which should not happen when a book on food is being read, even if the indigestion is only of the mental kind.

The chapter dealing with the failure of the senses to act as watchdogs of health refutes Marie Lloyd's famous dictum on the healthful effect of "a little bit of what yer fancy." Not the sense of smell, nor taste, nor touch, nor pain, nor temperature, avail to warn the eater of danger. Wasn't rancid butter the rule up to the nineteenth century? Don't we defy the warning of the smell of game? Didn't man for years eat sand with his bread when grain was ground between stones? And yet in other cases a gamy smell, a gritty texture, a rancid taste are anathema.

There have been many recent discussions on the use of artificial colours in foods, but Mr. Renner has practically nothing to say about this. He treats colour mainly from the point of view of dirt in foods and of colours of packages of retailed food. His findings on the latter are curious. Green packages are not popular because it is the colour of some early discovered poisons and unripe fruit. Red is connected (in the mind of the buyer) with the colour of rust and may be a sign of nutritious iron content in food! Apart from such a cursory survey, he is content with quoting verbatim a passage from Aldous Huxley's *Beyond the Mexique Bay*, which deals with natural colours.

Relating bacteriological infection with our existing food habits and food laws, the author states that we are forced, among other ones, to the conclusion that "every meal must be considered as a kind of biological experiment, even if we do not think of it in such terms, not from the point of view of far-reaching consequences upon our nutritional state and the maintenance of health, but of the consequences which the meal may have within a few hours. If we are not

* *The Origin of Food Habits.* By H. D. Renner. Pp. 261. London. 15s. net.

fully confident, *it is mainly those consequences which we have in mind when we think about what we are going to eat.*" The italics are mine.

Under the caption "Gastronomy" are some comments on "poets of smell." It is gathered that the psychologist Henning introduced a new yardstick into literature by distinguishing between poets who are endowed with a keen sense of smell and those who are not, and that he developed it into a criterion of literature. That this has not caused a furore in literary circles is explained by the fact that Henning's discovery has not even yet reached them.

Among the host of other subjects is the cooking of food, French cooking, the origin of port drinking in England, and the well-worn topic of Ireland and potatoes.

The author skips lightly over the white *versus* brown bread controversy, with a bias in favour of white, and finalises the matter by saying that "the arguments raised against the consumption of white bread are fallaciously based."

At times when the author is living up to his publisher's assertion that he "takes great delight in undermining our pet beliefs concerning food with amusing examples and experiments" his particular brand of facetiousness may not appeal to everybody. However, while his book will not supplant Brillat-Savarin in one reader's affections, it can be confidently recommended to all interested in food.

T. C.-W.

Correspondence

Pork Products

TO THE EDITOR OF FOOD MANUFACTURE

SIR,—Replying to Mr. Clifford Skertchly's criticism of my "parody," I at least have not been responsible for any "nonsense" on the subject discussed, and I speak with well over 20 years' continuous practical experience in large (slaughtering) bacon factories.

I did not suggest that curers "welcome" such a range of pig weights as from 5 to 14 score lb., but stated that "in *modern* mild-curing factories the minor technical problems they raise are comparatively easy to overcome." That is how I find it, but it should be noted that it is not denied that there are difficulties; but as one who has to deal with them, I, with practical experience of pig-feeding, nevertheless approve the Ministry's encouragement of heavier pigs as a war-time measure. As a consumer I still prefer such English bacon as can be had to the fat American used to make up the ration.

The curer knows very well that in normal times his job is to try to meet the consumer's requirements, but in the meantime he must do the best he can with such raw material as is most economical from all standpoints.

Mr. Skertchly seems to link mildness of cure and weight with leanness, but actually there is little relationship. As to leanness, it is as easy, if not easier, to produce a *fat* pig (*i.e.*, a pig having excessive back fat, etc.) in a few months as a lean one in a few years! There would be no point in going into detail here, as Mr. Skertchley is obviously no more a pig farmer than a slaughtering curer, but perhaps I might put it that, just as we are said to be "what we eat," so are pigs. The feeding-stuffs used generally in peace-time would produce a fat pig in a much shorter time than the average type of "swill" available to-day. In fact, "swill" feeding is more successful with older pigs.

Of course, grading now-a-days by pre-war contract standards would be lunatic, but curers are still required to grade into "Northern" and "Southern," which might be taken as synonymous with "fat" and "lean." But a 6-score pig might be fatter than a 13, which causes no surprise to those in the industry. However, instead of fat bacon going to the North, as was generally the case before the war, it is now sold as near the curer's factory as possible; hence the London factories have to sell their "fat" and "lean" bacon locally, whereas normally London would demand only the leaner grades, and the fatter ones would go north. This might explain why, whilst on the average I find that over a period the thousands of pigs passing through my hands are leaner, though heavier, than those produced in much the same localities pre-war, Londoners notice that much of the English bacon offered for sale now-a-days is fatter as well as coarser.

In the meantime, whilst curers regret they have no alternative but to supply mostly such coarse and heavy bacon, Mr. Skertchly can take it that their chief problem is not so much carcase weights, but retaining a sufficiency of labour to cope with the pigs available.

If I might refer to your editorial account of "a recent broadcast discussion on 'Pigs on the Farm'," my impression was that only one of the three speakers actually expressed the opinion "that the future of the industry in this country lay . . . with the general mixed farmer—a few pigs on every farm." At least one of the other speakers, being a successful large-scale producer and good business man, knows better, and, in my humble view, there is room for both types of producer; that is, so long as "a balanced farm economy" does not mean that the requirements of the consumer are to be overlooked.

As to whether the British public would "demand the same young lean bacon after the war as they had done before," enlightened pig producers will not be anticipating a demand for the bred-and-fed-any-old-how kind of pig, by the production of which earlier generations of farmers presented the home bacon market almost completely to foreigners.

The home farmer must study the consumer at least as much as, if not more than does the overseas producer, or he will only have himself to blame if the consumer shows a preference for imported produce.

I am confident, however, that the hoary old arguments about lack of constitution, flavour, etc., in the animal that provides the kind of meat in demand, so dear to this very conservative (though admittedly able) broadcaster, will not unduly deter at least the younger farmers coming along to-day. In any case, farmers generally are more mentally awake to-day than ever before, and this should show itself to good effect when once again the food industries can give ear to the special requirements of the ever-more-discerning consumer.

Yours faithfully,
C. E. B. BRETT.

The Virtues of the Soya Bean

THOUGH the magic soya bean has in these war years made before the British public a somewhat secretive *début* disguised in that example of confused feeding, the sausage (austerity standard), its enhanced importance is due to a sprouting in directions of the commercial field other than the most ancient one of foodstuffs. In Japan, Germany, and the United States it has developed because of soya protein and oil for plastics, and of soya oil for paints, enamels, linoleum, soaps, and core oils for foundries. Germany, for example, in 1933 imported over a million tons of soya; Japan invaded Manchuria for her millions of tons of soya production; and the United States planted millions of acres to supply her automobile and railroad industries with core oils, shock-absorber oils, and plastics, together with the 2¾ million gallons of soya oil needed annually for her paint trade. The latter country visualised 50,000 acres of soya to be planted for every million cars, while the Fordson Estates subsidiary in Great Britain further emphasised the soya bean as essential raw material. Within recent years drying oils have been prepared by inclusion of manganese and cobalt driers, so that as paint vehicle also the automobile industry found in soya a cheap base for expansion.

Among the extensive literature which has developed as the pen endeavoured to keep pace with the soya farmer's plough, a "cheaper re-issue" of the book* by C. J. Ferrée, published in 1929, is something of a surprise at a price of 3s. 6d., in view of war-time book prices and the fact that a number of good plates are included.

The book is concerned, as its title suggests, with the soya bean as foodstuff; and despite certain "scientific" or technical data, such as a full list of amino-acids present (names rather frightening to the layman) and comparison with those from cow's milk and ox muscle (a comparison which will satisfy the vegetarians), the book must be regarded as one for popular reading rather than for the shelves of food technologists who did not purchase it in 1929. Thus, for example, a series of household recipes at the end will be much appreciated by British housewives who are daily adjured in morning broadcast, as Mr. Ivor Brown put it, to lift up first the limbs, then hearts, and then saucepans. *En passant*, let it be noted, such recipes take us back nostalgically to years of Mrs. Beeton—or even to Mrs. Hannah Glasse's *Everlasting Syllabub*—with such directions as "Beat up ¾ pint cream, ten yolks of egg . . .," although there is admittedly a forecast of more austere days in adding "ten saccharin tablets."

A second reason why food technologists will deem the book non-specialist in type lies in the date—1929. This is very much in evidence, since a great deal in the world of soya has happened since then. References to the Government of Manchuria "taking every possible step" should now read that Japan has taken every possible step to dominate as much of the world's soya as possible. A second example is that American production by 1935 had become quadrupled compared with the 10 million bushels for 1928, more than half of the 40 million bushels coming from Illinois. Thirdly, although the comparison with the pea-nut, or *Arachis hypogœa*, on page 5 gives soya a much higher protein content, any comparison must emphasise that Arachis needs no coaxing, spreading like the weed it is through West Africa.

Mention of cultivation brings to the fore another point—viz., an acceptance with reserve the statement on page 9 that, "if properly treated, soya will grow practically on any soil." Well, we have properly treated and coaxed it in this friendly land so ready to take in any stranger, but no! Apart from the Fordson Estate venture in Essex, Rothamsted and Woburn have shown (*vide* Sir E. J. Russell in *The Times*, February 17, 1941) that soya has proved a difficult guest to please. The past ten years prove that only 6 to 7 cwt. beans per acre instead of 15 cwt. are possible; oil content is lower than the 18 to 20 per cent. in imported soya; and that no variety is particularly suitable for the English climate. H. Hunter (*ibid.*, March 24, 1941) gives equally doleful results as a result of the Cambridge trials, only two out of sixty varieties having any chance of fruition. What with our frost risks delaying sowing until April (as H. H. Mann points out in *Nature*, 1941, **147**, p. 660) and the necessity of maturing before September, together with lack of varieties which yield more oil, the soya is hardly a success in our hospitable shires.

References to lecithin in margarine "in order to increase the nutritive value" and to soya chocolate were written before the important rôle of lecithin had been fully realised. Lecithin is a protective colloid in foodstuffs to such an extent, and offers such promise, that any book dealing with soya as food is incomplete without a survey, despite the low yield of 12 lbs. lecithin per ton of soya treated. Lecithin is useful in margarine in order to circumvent the adhesion of milk solids to the pan; in chocolate, where it not only lowers viscosity while in the molten condition, but hinders the tendency for cacao butter to crystallise and give rise to "bloom" when the super-cooled fat appears on the outside. Its emulsifying properties also appear in bakers' shortenings, improving creaming qualities in these and in mayonnaise, and preventing the formation of sediment in cocoa. Moreover, a statement on page 56 (attributed to Dr. J. Freud) that lecithin in soya is identical with that in egg yolk is not in agreement with work done prior to 1929, showing that lecithins from the animal world have a phosphorus-nitrogen ratio less than 2·21, but this is greater in soya lecithin.

Nevertheless, despite such inaccuracies as the above, together with a few loose terms (like "chemical properties" on page 11, which should read "constituents," or the statement on page 38 that soya beans "obtain their food from the air"), the book will serve the purpose of stimulating public interest in the soya bean and its flour, no longer liable to rancidity on short storage. It opens appropriately with ancient China, with the Emperor Shen Nung, "The Heavenly Farmer," with the botany of soya, and its inoculation with nitrogen-fixing bacteria to improve cultivation.

* *The Soya Bean and the New Soya Flour*, by C. J. Ferrée. Pp. 79+xi. Cheap edition, 3s. 6d. net.

A chapter on chemical composition serves to emphasise the high protein and fatty content, together with the very low content (less than 1 per cent.) of starch—a fact which might be developed for those requiring a starchless diet. Then follow sections surveying the soya bean from the foodstuff point of view, tracing its spread from east to west, referring to its value proved in the Russo-Japanese War, and to Japan's experiment of 1908, when she supplied several shiploads of soya to Britain and the Continent just when cotton seed and linseed supplies were insufficient for meeting oil seed demands. Page 22 brings references to soy sauce, in which Worcester might have been included; page 24 includes a table of composition which obviously refers to soya residues and not to soya fat.

Finally, one must refer to the yellow jacket or "puff," on which is printed a "war-time addendum" referring to increased application of soya in soups, sausages, macaroni, etc., and to its use by the American Army (whereby history repeats itself long after the Russo-Japanese conflict). Such a method of including a postscript is hardly suitable when book jackets get lost or damaged in use. It includes, moreover, what is very much an understatement in the words: "During this time (*i.e.*, the last fourteen years) the prominence of the soya bean . . . has gained further momentum." The upward curve of soya in world economics is such that fact outbids fiction, the magic bean outdoing the old Teutonic tale of Jack and the Beanstalk, in which, it will be remembered, "Jack" typifies Man, who "avails himself of these treasures [now soya?] and becomes rich."

M. S.

Syrups from Apples

TWO TYPES of syrup, one for industrial uses and the other for table use, can be made from apples, according to a report by Drs. R. E. Buck, J. J. Willaman, and H. H. Mottern to the Division of Agriculture and Food Chemistry of the American Chemical Society.

Investigations on apple juice were made to eliminate the substances imparting flavour, odour, colour, and jellification, leaving a more or less flavourless sugar solution that could be evaporated under vacuum to a bland syrup similar to commercial invert syrup, which is well known in the bakery, ice cream, soft drink, and other food industries. Clarification for the industrial syrup was with heat and lime.

A hydraulic press is used to express the juice, which is treated with a slurry of hydrated lime until the *p*H is 8·0 to 8·5, heated to 175° to precipitate the pectin, and filtered. The clarified juice is acidified with 1·3 sulphuric acid (or other acid) to a *p*H of 5·0 to 5·5 and then evaporated under vacuum to a syrup containing approximately 75 per cent. of solids.

Since the yield depends directly on solids content, varieties of apples, yielding juice of high solids content are desirable. High acidity (0·6 per cent. or higher) may lead to precipitation of calcium malate, which would necessitate extra treatment to eliminate it. Apple syrup made by this process is amber in colour, very sweet, and bland. It has no distinctive flavour, not even that of apple, and has a slight bitter aftertaste, which is probably due to an excess of lime salts remaining in the finished syrup. In the above process, lime has to be used in sufficient quantity to neutralise malic acid and to destroy the pectin of the juice. A mixture of three sugars—levulose, dextrose, and sucrose, with the levulose predominating—constitutes from 83 to 89 per cent. of the total solids, and hence about 65 per cent. of the syrup. Although the industrial type of apple syrup is palatable and is highly relished by many people, it does have a slightly bitter aftertaste.

A second process was devised, in which the malic acid is removed by "anion exchangers." These are similar to the materials used in the beds in water-softening tanks to remove lime. The apple juice is flowed through a bed of anion exchanger and the malic acid is removed.. The treated juice then requires but a small amount of lime for pectin removal, and the resultant syrup is just concentrated sweetness.

Gustation

(*Continued from page* 205)

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Fuel Economy by Steam Trapping

FOR far too long has steam condensate been allowed to run waste and for far too long when someone has decided to fit a steam trap to a machine has it been the practice to acquire a trap entirely unsuited for the job, in some cases making a bad job worse. The appearance of a book* on what is to many works engineers a tricky subject is to be welcomed.

Steam Generation

In this book every phase of the subject has been dealt with. Firstly, the author has set out to deal with the chief characteristics of steam and condensate. These are thoroughly dealt with, the purpose of generating steam being discussed, and a clear picture given of the transfer of heat from fuel till final superheating of steam is accomplished. This is followed by an explanation of the need for making use of the heat which is left in the condensate after the steam has done its work in the processing machine. Valuable practical hints are given, and as these are accompanied by simple drawings, there is no reason why, after careful reading of the first chapter, an intelligent works manager, without any engineering training, should not be in possession of sufficient engineering knowledge about steam generation and condensation to give most works engineers a few tips.

Having convincingly demonstrated that condensate can, and should, be utilised, the author briefly deals with the use of exhaust steam, pointing out correctly that exhaust steam from engines (or pumps) can be made to give up its heat instead of discharging uselessly into the atmosphere; instructions are given as to *how* the exhaust steam can be usefully employed in various ways.

Steam Trap Design

A chapter gives a detailed description of the different designs of steam trap in common use and is followed by a further chapter (one of the most important in the book) dealing with the installation of steam traps. It is not generally recognised that a steam trap has two functions :

(*a*) It must pass all the condensate that forms in the section of the plant which it is draining, and (*b*) it must hold back any steam that reaches it.

Faulty steam trap installation can make it impossible for the trap to carry out this work efficiently; the different faults encountered, and the remedy for these faults are fully dealt with in the section on Steam Trap Installation.

The evil of allowing air to remain in the steam has been demonstrated in many factories, sometimes resulting in loss of life through plant being waterlogged, but from the heat transference point of view air in steam can be a major form of evil, and as it reduces temperature also, the author has dealt with these points. Typical examples are given of savings effected by the reduction of the air content in the steam spaces of industrial plant, cases referred to being with textile machinery; with steam-jacketed pans for jam and soup-making. In each case considerable saving was effected, or production increased.

The Need for Air Vents

The need for careful provision of air vents is dealt with, and sketches are given showing how to set about their installation in the most efficient position. The author further goes on to deal with steam circulating systems, and explains why some are more efficient than others.

A special chapter on hot water supply for kitchen and hospital equipment deals with heating calorifiers, service calorifiers and their temperature control. The portion dealing with heating systems should prove interesting to all those who have had occasion to put them in their factories, as many factories so fitted have not been installed either efficiently or with sufficient regard to safety.

Jacketed Pans and Evaporators

Chapter seven of this book should be read and reread by managers and engineers of factories using jacketed pans and evaporators, as the information on air-venting and steam trapping in these types of vessels is very practical, and not always put into practice.

It will be seen that the question of steam trapping and venting has been dealt with in this book very fully. It is evident that its author is steeped in experience of this class of work, and such information as is given is by no means common knowledge. Even specialists in fuel economy should keep a copy of this book on their desks for reference. Others interested in the subject may be referred to the following quotation from chapter seven of the book :

> Engineers have for generations been concerned with the raising of steam. It has also been their job to design, erect and run the power engines in which the steam is used. They are, however, seldom allowed to have any hand in the running of the process plant in which also their steam is used. That is the job of the production man, or the works manager, or the chemist. The production man is not often a steam expert. Not only are all steams alike to him, but the availability of steam is something which he accepts as a right—like water at the tap. The cost of steam—even if he knows what it is—is generally only a very small percentage of his total cost of production. Apart, therefore, from plant maintenance, the boiler-house and power plant are the engineer's job. Here the cost of steam-raising and the cost of power is the be-all and end-all.

Now that the coal situation is so serious and coal cuts are being applied to industry, not an ounce of steam should be wasted, both in the national and the factory owner's interests. This book will be very helpful in these matters if the right people will act on the information given.

H. C. A.

* *Steam Trapping and Air Venting*, by L. G. Northcroft. Pp. 172. 10s. 6d. net.

Vinegar Standards

A Memorandum prepared by the Interdepartmental Committee on Food Standards

MALT Vinegar means the product containing not less than 4 per cent. weight in volume of acetic acid, $CH_3.COOH$, made by the alcoholic and subsequent acetous fermentation without intermediate distillation of an infusion of malted barley with or without unmalted barley or other cereals, the starch of which has been saccharified by the diastase of malt; and includes the product obtained by fermentation of a cereal infusion as aforesaid, to which infusion has been added sugar in amount not exceeding 15 per cent. of the sugars present in the infusion as a result of the saccharification by the diastase of malt. It may contain added colouring matter.

Artificial Vinegar or **Non-Brewed Vinegar** means a solution of acetic acid of edible quality, with or without added colouring and/or flavouring matter, containing not less than 4 per cent. weight in volume and not more than 8 per cent. weight in volume of acetic acid, $CH_3.COOH$, the acid not being wholly produced by a process of acetous fermentation; but does not include such a solution containing neither colouring nor flavouring matter unless so sold or described as to lead an intending purchaser to believe that he is purchasing a description of vinegar.

Concentrated Artificial Vinegar or **Concentrated Non-Brewed Vinegar** means a solution of acetic acid of edible quality, with or without added colouring and/or flavouring matter, containing not less than 50 per cent. and not more than 60 per cent. weight in volume of acetic acid, $CH_3.COOH$, the acid not being wholly produced by a process of acetous fermentation; but does not include such a solution containing neither colouring nor flavouring matter unless so sold or described as to lead an intending purchaser to believe that he is purchasing a description of concentrated vinegar.

Spirit Vinegar means the product, with or without added colouring matter and containing not less than 4 per cent. and not more than 15 per cent. weight in volume of acetic acid, $CH_3.COOH$, obtained by the acetous fermentation of a distilled alcoholic acid.

Distilled Vinegar means the product, with or without added colouring matter and containing not less than 4 per cent. weight in volume of acetic acid, $CH_3.COOH$, obtained by the distillation of malt vinegar.

The definitions of distilled vinegar and malt vinegar conform to current practice, the Ministry of Food having in 1942 sanctioned the addition of sugar to the wort in the manufacture of malt vinegar.

In regard to products obtained by diluting acetic acid, the Memorandum states that the Malt Vinegar Brewers' Federation raised particular objection to the use of the name **non-brewed vinegar,** claiming that the term is misleading as to the source, nature, substances and quality of the article, and pointing out that in other countries these products must be labelled so as to distinguish them from productions made by fermentation. The Federation also referred to the statement issued by the Society of Public Analysts and Other Analytical Chemists in 1935, recommending the use of the description " artificial " or " imitation ".

The Association of Non-Brewed Vinegar Manufacturers informed the Committee that the Society of Public Analysts had not consulted them before issuing their statement. They consider that the description " artificial " or " imitation " implied that the product was inferior, which they did not admit.

The Federation suggested that the term " non-brewed " had only been used during the last five years. The Association claimed that it had been in use to a gradually increasing extent for at least twenty years, but agreed that its general use dated from the case of Sutton *v.* Tame. In this case, which came before the County of London Sessions Appeals Committee in 1937, and concerned a sale of coloured diluted acetic acid when **table vinegar** was demanded, it was decided that the sale of a substance as " vinegar " or " table vinegar " without any qualification or explanation as to its origin being given by the seller to the purchaser implied that the product had been produced by a process of fermentation. In announcing this decision the Chairman of the Appeals Committee remarked that " the fact that a very large majority of manufacturers add such words as ' wood ', ' non-brewed ' or similar words of that description to the products shows, in the opinion of the Committee, that the words ' table vinegar ' are not considered by the custom of the trade sufficient to describe it ". The Federation informed the Committee that they did not accept the view of the manufacturers of the products consisting of diluted acetic acid that these remarks justified the use of the name " non-brewed vinegar ".

The Committee state that their main interest is the protection of the consuming public. If the product were now to be marketed for the first time, they would have regarded " artificial " as a more appropriate description and better calculated to convey to the public the idea of a product which embodies some, but not all, of the properties of malt vinegar. The Committee felt bound to take cognizance of the fact that the description " non-brewed " has been in use to a greater or less extent for several years, that no instance of a successful Food and Drugs Act prosecution was brought to their notice, and that the description did not attract any adverse comment in the case mentioned above. They were of opinion that the description " non-brewed " probably conveys no more to the general public than that the product is something different from malt vinegar. In recommending the above definitions they therefore adopted the alternative description " artificial vinegar or non-brewed vinegar ".

Similarly, for the concentrated products requiring dilution before use the Committee adopted the description **Concentrated Artificial Vinegar** or **Concentrated Non-Brewed Vinegar.** The Committee also recommend that as a safety precaution all such products should be required to be sold at the same strength and be labelled with directions for dilution. It is also suggested that consideration be given to prohibiting their sale in small bottles.

Mites in Food

THE subject of mites in food has received a great deal of attention during the past few months, both from the public health authorities and by the manufacturers of flour products. It is of vital importance not only to the flour industries, but to the flour mixture packers, wholesalers, retailers and consumers alike, that a combined effort be made to clear up the present unsatisfactory position.

Recently many consignments of flour products, found to be heavily infested with mites of the Tyroglyphidæ group, have been condemned by food inspectors of local health departments as unfit for food. This decision has invariably been supported by their Medical Officer of Health and City Analyst. The subsequent action taken by the local authorities' officers has been different in various parts of the country. In one instance a case was heard before the Court on January 20, 1944, at Castle Eden, Co. Durham, where the retailers were prosecuted for selling a flour mixture which was heavily infested with mites when purchased. Another case was heard recently at Bootle Police Court when mite-infested egg substitute powder was the subject of the prosecution. Other prosecutions of a similar nature are pending.

In another part of the country a case in which the condemned consignment was valued at over £500 received entirely different treatment. Here the wholesaler was allowed to "surrender" the foodstuffs and a joint effort was made to bring the problem before the responsible people. All the bodies likely to be interested were notified, including the Ministry of Food (both Salvage and Infestation branches), the Medical Officer of Health of the area in which the food was packed, and the food manufacturer concerned.

Factory and warehouse were specially inspected and methods of prevention discussed. The Ministry, the Medical Officer of Health, food inspector and the packers all agreed that the material had been stored too long and under unsuitable conditions.

Some Characteristics of Mites

In a survey[1] recently published by the Department of Scientific and Industrial Research, Solomon points out that our information about tyroglyphid mites is very defective. They prefer stored products to be moist, and multiply best when the temperature is between 18° and 25° C. They are killed by heat, the temperature depending on the species; most species die after a few minutes' exposure to a temperature of 60° C., though a few require as much as 145° C. or even 180° C. to kill them. They resist low temperatures fairly well, but become dormant at about −4° C.; at 3° or 4° C., however, they continue to feed. Isolated mites are killed by 24 hours' exposure to −29° C.

To prevent infestation, foodstuffs should be stored as dry as possible, in dry, well-ventilated weatherproof quarters. Insects, rodents and birds all distribute mites, and should be excluded. Dust and dirt should be swept up regularly, and infested materials destroyed or treated to kill the mites.

Heating, drying, fumigation and toxic washes have all been used to disinfest goods invaded by mites. Drying is the most effective but may be difficult or inappropriate to carry out, and foods cannot always be subjected to heat without change. Fumigants have been widely used, with varying success, to stored grain. The use of non-toxic dehydrating dusts is perhaps more promising. There are obvious objections to using poisonous fumigants on food, but for empty infested warehouses they may be more valuable, although eggs of tyroglyphids resist many fumigants, including hydrogen cyanide. Washing or scrubbing with carbolic is a good way of treating woodwork. Pyrethrum and nicotine, the common insecticides, are ineffectual against mites. Hermetic sealing has a limited application. Mites can be removed from flour by sifting it through silk, and from grain by passing it through a cleaning machine.

Preventive Measures

Disinfestation is a very difficult and involved proceeding. Prevention is less difficult and more likely to prove successful. Dry, sound storehouses appear to be the first essential, but there are other factors to be considered. In many cases investigated none of the ingredients or the mixture were in the packing factory for longer than three weeks, a period which cannot be described as extended. Yet the time lag between packing and reaching the consumer was usually nearer six months. The exclusion of moisture and damp should perhaps be applied to the ingredients as well as to the storage conditions. Is the fact that home-milled flour has a high moisture content a source of trouble? It seems obvious that such mixtures should contain flours of the lowest possible moisture content. One practical suggestion is that the Ministry of Food should require labels on packings to be stamped with a date before which the contents must be used. This would discourage wholesaler, retailer and consumer from storing the foods too long.

Disposal of Infested Foods

The question of what should be done with food spoiled by mites cannot be answered without more knowledge. Although it has been suggested that large numbers of wheat mites may be consumed without ill effect, there is evidence to the contrary. Cases of colic and diarrhœa in horses and dogs have been ascribed to tyroglyphids in food, and they have been suspected of causing allergic manifestations in man. In cases of mild infestation the food could probably be used for animals after being disinfested.

It must be presumed that heavy infestation means complete wastage, not only of the mixture, but of packing material and of man-power hours of labour and distributive effort and expense. In these circumstances, the question should receive the immediate attention of our milling experts, as apart from the legal implications the conservation of food is second only to the preservation of life.

REFERENCE

[1] Solomon, M. E., *Tyroglyphid Mites in Stored Products*. H.M.S.O. 1943. 9d.

Trade News

A Packing Device

Even during the war, and in spite of restrictions on supplies, the use of self-adhesive cellulose tapes for sealing all kinds of packs containing food products has been extended considerably.

Its cleanliness and neatness alone would justify its future, but this simple method of sealing has much more to commend it to everyone who handles anything in the food line. A pack sealed with one of these tapes—"Sellotape" is one well-known brand at present used extensively by the Ministry of Food—is completely air-tight, so that goods are protected from damp, dust or any atmospheric deterioration while in transport here or overseas, or stored by wholesaler or retailer.

Obviously it is the ideal medium for sealing packs wrapped in cellophane, but it is equally effective on tin or any other material, and is delightfully easy to remove. The difficulty of opening cartons or tins no longer exists when the customer has only to peel off a strip of "Sellotape." Furthermore, he knows that the product has reached him unhandled from the time it was sealed by the packer.

Transparent tape is the most popular finish, but it can be supplied in various colours if a more artistic pack is desired. The "Sellotape" people also supply a completely waterproof variety known as "Selloproof."

* * *

Packing Case Labels

Bi-Way labels were put on the market by the Bi-Way Label and Printing Co. especially for the use of users of returnable wooden packing cases and crates so as to speed up by simplifying the returning process and so make for a quicker turn round of cases. Their design obviates re-labelling, re-tacking, re-addressing.

The labels are approved and recommended by the Joint British Railway Companies (Clearing House) and are sanctioned by the Ministry of Supply, Paper Control.

A New Association

A new association for the protection of interests of British manufacturers has recently been registered with the Board of Trade. It is the Association of British Business Equipment Manufacturers, Ltd., a company limited by guarantee, and will embrace the leading British manufacturers of metal business equipment for use in offices and factories.

The subscribers to the Association are: Roneo, Ltd.; Milners Safe Co., Ltd.; Tan-Sad Chair Co. (1931), Ltd.; Rubery Owen and Co., Ltd.; Chatwood Safe Co., Ltd.; Leabank Chairs, Ltd.; Sankey-Sheldon; Powers Accounting Machines, Ltd.; G. A. Harvey and Co. (London), Ltd.; Evertaut, Ltd.; Remington Rand, Ltd.; Constructors, Ltd.

From the subscribers, the following council has been elected: A. W. Toy (president), Roneo, Ltd.; B. B. Dyer (vice-president), Milners Safe Co., Ltd.; H. Shand, O.B.E., G. A. Harvey and Co. (London), Ltd.; C. E. Partridge, Rubery Owen and Co., Ltd.; F. F. Chisholm, Evertaut, Ltd.

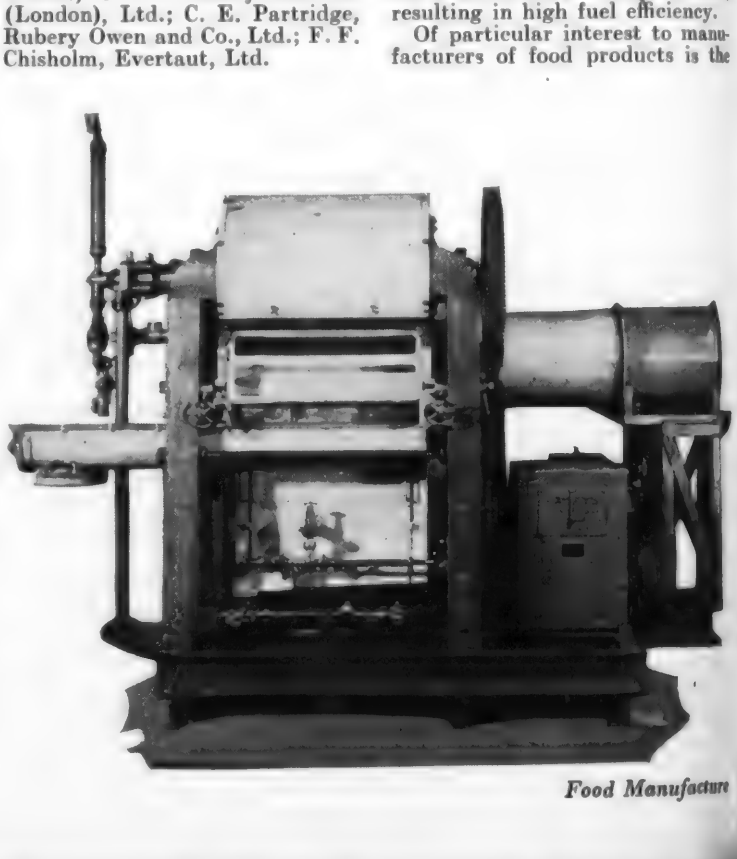
A New Spray Dryer

Recent additions to the wide range of chemical process plant manufactured by George Scott and Son (London), Ltd., covering evaporation, distillation, solvent extraction, drying, soap and glycerine, fat splitting and fatty acid distillation, caustic soda production and recovery, etc., include a new spray drier—embodying certain unusual features—patent spray film drier and patent forced circulation thermo-compression evaporator.

The unique feature of the spray drier is the streamlined atomiser directly actuated by high-speed motor, thus eliminating gearboxes and similar devices.

Very gratifying results are being obtained from the patent high vacuum distillation plant on fatty acids, glycerine and an increasing range of organic products. On fatty acids it is possible to maintain continuous distillation with fractionation, without resort to the use of open steam, resulting in high fuel efficiency.

Of particular interest to manufacturers of food products is the



patent forced circulation evaporator, available in numerous metals and alloys by means of which remarkable concentrations are attainable. The necessity for fuel economy has resulted in increased use of thermo-compression. This immediate necessity will prove a permanent benefit.

Of equal interest to food manufacturers is the continuous-band drier, which has particular application in the drying of many delicate products.

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Dried Yeast

Scientific research in the last ten or fifteen years has shown that brewers' yeast, when dried with proper care, is not only unrivalled as a source of the entire vitamin B complex, but provides in addition a number of most valuable dietary factors.

Phillips Yeast Products Ltd., the manufacturers of Phillips Tonic Yeast, are producing, under the name of Philex, a nourishing extract of their finest quality yeast. The proprietors claim that the product can be highly recommended as a flavouring agent for many different foods and such dishes as soups, stews and gravies. Its content of the essential dietary factors present in brewers' yeast adds to the nutritive value of the food and provides it as well with a stimulating flavour.

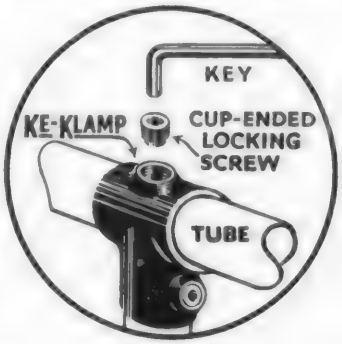
* * *

From Aeroplanes to Eggs

A new industry for Moose Jaw Progress Manufacturing Company is noted in the Board of Trade's news letter. The company, as now, will make "Aren's Control" for aircraft; but with the coming of peace it will turn its attention to the making of egg-sealing machines, automatic egg-grading machinery, egg-breaking equipment, candling lamps for eggs, refrigerators for country butchers and egg-grading stations and poultry machines, the news letter points out. The company recently opened an office, where technicians will engage in research service and designs for wood gas producers, chemical plants and related industrial equipment.

Tubular Structures

The handling, packing and storage of food calls for equipment both varied and ingenious. The Ke-Klamp system of tubular construction, although comparatively new to the food trade, offers many advantages, among which are adaptability and flexibility. It is a neat device by which tubes are locked rigidly together into practically any predetermined form, the erection being carried out by unskilled labour. The tube forms a sliding fit, and when in position is locked there by a cup-ended



steel screw, which is screwed down through the Ke-Klamp until it bites into the tube, as will be seen in the diagram. A structure can be as quickly dismantled and erected on another site, or the material used again for other purposes.

Shelves, benches, racks, tables, together with a hundred and one structures for holding or protecting valuable equipment, are among the uses to which the device can be put. The makers are the Geo. H. Gascoigne Co., Ltd.

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Industrial Dermatitis

Probably the most prolific cause of lost working time in industry is to be found in the group of skin diseases classed and comprehensively known as "Industrial Dermatitis." Practically no industry is immune from its ravages—whatever form it may take—and the starting point of the disease is the infiltration into the pores of paint, tar, metal dust, solvents, chemicals, and a host of other substances that are necessarily used in the thousand and one manufacturing processes of modern industry.

The importance of screening the skin against this infiltration was first recognised by Messrs. Sternol, Ltd., the well-known oil refiners, who, for years past, have saved, in the aggregate, literally millions of working hours to the leading industrial concerns in the country by the production of their "Sternocleanse" anti-dermatitis cream. To-day it is in standard and daily use in the large majority of manufacturing processes, in H.M. Ordnance Factories and in various branches of H.M. Forces.

In general factory procedure, workers apply "Sternocleanse" to hands and arms before starting work, thus setting up an imperceptible but impenetrable "glove" on the skin, which makes entry of the offending impurities into the pores a matter of impossibility. After work is done, just ordinary washing in soap and water removes the film, the dirt and the impurities, leaving the hands hygienically clean.

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Solder Creams and Paints

Solder paints and creams contain solder in powder form intimately mixed with flux and embodied in a suitable medium. They provide a simple method of applying solder which for many purposes has superseded the use of solder in stick form or hot dip tinning. In tinning operations the cream is brushed on the parts to be treated, which are then heated until the solder melts and forms an adherent coating. For sweat soldering the cream is applied to the joint members before assembly, so that the solder is located definitely in the joint.

The creams are not suitable for all types of work, but their use in industry is increasing.

Creams or paints can be used for mass-production soldering. Some successful installations use a conveyor belt passing through a heating oven, but it is possible to attain high production rates with simple devices using open flame heating, the articles being carried along by conveyor belt or rotating table. Additionally, of course, joints can be painted, assembled and heated in batches. The makers are Fry's Metal Foundries, Ltd.

News from the Ministries

Changes in National Flour

As from May 1, 1944, the minimum proportion of home-grown wheat to be included in all blended grists was reduced to 50 per cent.

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1944 Crop New Potato Prices

The Ministry of Food announces that Orders have been made reintroducing the general scheme of Potato Control for the 1944 crop and prescribing marketing arrangements for new potatoes similar to those in force last season, together with prices and transport zoning arrangements. The Potato Control system is prescribed by the Potatoes (General Provisions) Order; the new potato prices and zoning of transport are contained in the New Potatoes (1944 Crop) Order.

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Mr. H. E. Davis

The New Zealand Government has asked for the release of Mr. H. E. Davis, Director of the Milk Products Division of the Ministry of Food, whom they seconded to the Ministry of Food at the outbreak of war. The Minister has regretfully agreed to this request and Mr. Davis left the Ministry on April 15, 1944.

Mr. J. W. Rodden has been appointed Director of the Milk Products Division in succession to Mr. Davis, and Mr. G. S. Dunnett, Head of Division, has been appointed Deputy Director.

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Mr. R. G. Crosbie

Mr. R. G. Crosbie, Assistant Director of Fish Supplies, has resigned from the Ministry of Food to take up the appointment of Food Consulting Officer in Trinidad. He has been in charge of the Distribution Branch of the Fish Division.

Mr. Crosbie, who was connected with Messrs. Swift and Company, Smithfield, joined the Ministry at the outbreak of war. He has served in the Meat and Livestock Division of the Ministry and as Deputy Divisional Food Officer for the Southern Division of England.

Mr. W. Jackson Wallace

Mr. W. Jackson Wallace has been appointed Senior Assistant Director of the Fish Division in the Ministry of Food. Mr. Wallace, who has already taken up his duties, is in charge of the distribution of white fish and herrings. He is a Director of MacFisheries, Ltd., who have placed his services at the disposal of the Ministry.

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Mr. M. P. Roseveare

Mr. M. P. Roseveare, who as principal assistant secretary of the Ministry of Food has been the chief organiser of the nation's food-rationing schemes, is leaving the Department. He was formerly a Board of Education inspector. The Board, faced with important developments in its work, now want his services again. At the end of last month, therefore, he returned with the status of senior chief inspector.

Mr. Rooseveare's successor is Mr. S. W. Hood.

Before the war Mr. Hood was with Sir Henry French, the Food Ministry's permanent secretary, in the old Food Defence Plans Division of the Board of Trade. Later he was a deputy secretary of the Ministry of Food in London. More recently he has been with the British Food Mission in Washington.

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Nuts

The Minister of Food has made an Order amending the Nuts (Control and Maximum Prices) Order, 1942. The new Order fixes maximum prices on sales by wholesale and retail for certain varieties of nuts not specified in the main Order, and increases the maximum prices for most of the varieties previously specified in the main Order.

As the maximum price now prescribed for hand-picked selected peanuts differs from that for other qualities of peanuts, the mixing of peanuts of different qualities is prohibited.

Disposal of Edible Pig Fat

The Ministry of Food announces that W.M.S.A.s may have for disposal small quantities of edible pig fat from the Ministry's slaughterhouses. In the first place this fat will be offered as far as possible to the Group IV Manufacturers (pork butchers) attached to the depots, and any surplus above their requirements will be allocated to general butchers for manufacturing purposes. This will not count against their manufacturing allowance.

The price to be charged by W.M.S.A.s for edible pig fat sold to Group IV manufacturers and general butchers is 6d. per lb.

The practice that obtains in certain districts of distributing the kell or caul fat with the pluck will not be affected by the above arrangements.

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The Chocolate, Sugar Confectionery and Cocoa Products (Control and Maximum Prices) Order, 1944

The Minister of Food has made the Chocolate, Sugar Confectionery and Cocoa Products (Control and Maximum Prices) Order, 1944. This Order revokes the following Orders and consolidates them into one Order: the Cocoa Butter (Maximum Prices) Order, 1941, the Cocoa, Chocolate and Sugar Confectionery (Licensing and Control) Order, 1941, the Sugar Confectionery (Maximum Prices) Order, 1941, the Chocolate and Chocolate Confectionery (Maximum Prices) Order, 1941, and the Chocolate Couverture (Maximum Prices) Order, 1942. The new Order also formally revokes two lapsed Orders—namely, the Sugar Confectionery and Chocolate and Chocolate Confectionery (Special Reserve Stocks) Order, 1942, and the Sugar Confectionery and Chocolate and Chocolate Confectionery (Distribution) Order, 1942. The new Order came into force on May 28, 1944.

The principal alterations are as follows:

Licences to manufacture issued under the previous Orders remain in operation as if granted under the new Order. The licensing pro-

visions are brought into line with the Ministry's general policy, and licensed manufacturers are required to keep certain additional records relating to their production.

It is expressly provided that it shall be an offence to deliver products which are not classified with tickets or labels purporting to show that they are classified.

An additional defence is provided in proceedings for an infringement of certain provisions of the Order protecting traders who, through no fault of their own, may have unwittingly committed technical breaches of the Order.

Small manufacturers (*i.e.*, broadly those who manufacture less than 25 tons per annum) will not normally be required to hold a licence to manufacture under the new Order but will require to be licensed under the Food (Restriction on Dealings) Order, 1943, if their principal method of sale is by wholesale.

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The Home Grown Tomato (Control and Maximum Prices) Order, 1944

The Minister of Food has made the Home-Grown Tomatoes (Control and Maximum Prices) Order, 1944. This year the Transport Directions have been incorporated in the Control and Maximum Prices Order instead of being the subject of a separate Order. The Order provides new maximum price schedules for the 1944 season but otherwise re-enacts the provisions of the Orders and Directions which it replaces, with certain modifications of which the following are the more important.

The distribution scheme will operate from May 30 to November 4 inclusive. This is described in the Order as the "" period of full control." The limit of road transport has been reduced from 40 miles to 35 miles. There are certain modifications of boundaries in the areas both for maximum prices and for transport.

The retail prices have been reduced by amounts varying from 1d. to 2d. per lb. for the greater part of the season.

The time lag between the changes in the maximum prices on sales by the growers and on sales by wholesalers and retailers has been discontinued on price rises but has been retained and readjusted on price reductions.

In the south-eastern part of England growers' prices will fall on Thursdays and distributors' prices will fall on Mondays, except on the occasion of the last price drop when growers' prices will fall on the Thursday, wholesalers' prices on the Saturday, and retailers' prices on the Monday. In the remainder of the United Kingdom the growers' prices, on the occasions of all price falls, will change on Saturdays and distributors' prices will change on Mondays.

The growers' price to manufacturers is the same as in 1943.

The Order came into force on April 21, 1944.

* * *

Amendment to Food (Sector Scheme) Order

The Food (Sector Scheme) Order has been amended in order to permit First-Hand Distributors to transport specially restricted food from premises other than their own approved premises, provided the food is delivered to the approved premises of a Wholesaler or a Multiple Central Depot and provided that such transport is otherwise in accordance with the Sector Scheme.

The amendment also provides for the substitution in the Second Schedule to the Order (list of goods to which the Scheme does not apply) the entry "Low Fat Soya Products" in place of "Low Fat Soya Grit"; Frozen Liquid Egg is no longer subject to the restriction of the Sector Scheme and Canned Meat Paste and Canned (Meat) Soups cease to be "specially restricted foods."

The Order came into force on May 1, 1944.

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Changes in Grist for National Flour

The use of barley by millers as a diluent was discontinued as from March 13. The breadmaking grist will therefore consist entirely of wheat except in a few areas where there are limited supplies of rye. Such supplies will be absorbed as rapidly as possible at a rate not exceeding 2½ per cent. of the grist..

Dried Bananas for Cœliac Patients

The Ministry of Food announced that a small quantity of dried bananas is now available for distribution to sufferers from cœliac disease. Distribution is being made under the auspices of the Red Cross and St. John War Organisation, who have very kindly offered to send supplies free of charge at the rate of 14 lbs. per month to any patient who produces or has produced to the local Food Office satisfactory evidence that they are suffering from this complaint, or to hospitals where such patients are being treated.

Any patient or hospital wishing to take advantage of this should apply to the local Food Office. If they have not already submitted medical details to the Food Office for the purpose of obtaining the extra meat which is available for cœliac patients, a detailed statement will have to be provided to satisfy the Ministry's medical advisers that the applicant is a cœliac patient. Supplies will then be arranged for a period of three months for proved cases through the Red Cross and St. John War Organisation.

If the recipient wishes to continue receiving supplies after the initial three months, application must be made to the local Food Office, supported by a medical certificate, indicating that the applicant still suffers from cœliac disease.

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The Soft Fruit (Maximum Prices) Order

The Minister of Food has made the Soft Fruit (Maximum Prices) Order, 1944. The Order replaces the 1943 Maximum Prices Order (S.R. & O. 1943 Nos. 684, 818 and 902) and the 1943 transport directions (S.R. & O. 1943 No. 782). The new Order comes into force on May 16, 1944. Until that date the price of soft fruit is controlled by the 1943 Order.

There is no change in the range of soft fruits controlled by the new Order, and the price schedule is not substantially altered except in the case of bilberries where the picker's price has been increased from 7d. to 9d. per lb. Prices of all soft fruit except strawberries

and gooseberries (other than dessert gooseberries) are constant throughout the season.

The Order prohibits the transport of strawberries, raspberries, gooseberries and blackcurrants to or from any place in Northern Ireland from or to any place in Great Britain. The transport of strawberries and raspberries is also prohibited from Scotland and the North of England to the Midlands and the South.

* * *

Flour Shipments to the Isle of Man

The Ministry of Food wishes to point out that shipments of any flour to the Isle of Man are classed as "exports" for the purposes of the Flour Order, 1944.

The possession of a licence issued by the Manx Government under their Flour (Regulation of Importation and Exportation) Order, 1940, or of a permit from the Postal and Telegraph Censorship Department does not exempt such shipments from the export price provisions of the Flour Order, 1944.

Shippers of self-raising and other speciality flours should particularly note, therefore, that flour must have been bought from a flour miller or importer and at the correct price as prescribed in Table II of Part I of the First Schedule to the Flour Order (S.R. & O. 1944 No. 1) before it can be exported to the Isle of Man.

Sugar Rationing after the War

Sir William Rook, Director of Sugar in the Ministry of Food, said to-day that sugar rationing in Britain would probably have to be continued for "one or two years" after the war because of the chaotic conditions which were bound to prevail in Europe.

He hoped the present sugar ration would not have to be cut further during the war.

Commenting on the important part sugar would play after the war in nutritional requirements, Sir William Rook said it was hoped that some form of reserve would be created for supplies to fill the empty cupboards in the many countries it was hoped would soon be liberated.—*Reuter.*

Overseas Items

U.S. Vitamins

The U.S. will send 33 per cent. of its scheduled synthetic vitamin production in 1944 to its Allies, to liberated areas, and to other friendly nations, the United States War Food Administration has announced.

Synthetic vitamins include ascorbic acid (vitamin C), thiamine (vitamin B_1), riboflavin (vitamin B_2), and niacin (nicotinamide and nicotinic acid).

* * *

War Stimulates South Africa's Canning Industry

South Africa's fruit-canning industry has made great progress under the stimulus of war, recently stated Mr. A. P. Van der Post, senior Trade Commissioner in Britain for the Union. It had not only supplied local needs but also supplied those of the large convoys which rounded the Cape regularly from 1940-43, the Admiralty and the Army overseas. In addition it had provided Britain with fruit pulp and increasing quantities of jam and marmalade.

Through the help of the Ministry of Food, the Union was also enabled to find a British market for canned crawfish. There had been satisfactory progress in the past 18 months in the dehydration of fruit and vegetables.—*Reuter.*

"Elixir of Life"

On the ground that the former designation aroused sales resistance, the U.S. Senate voted to officially change the name of "skim milk" to "dry milk solids." Rejected: an amendment by Louisiana's Senator Overton to change the name of "spinach" to "health and strength greens" and "castor oil" to "elixir of life."—*Extract from "Advertising and Selling."*

* * *

"Peoples' Granaries" for Italy

Plans to simplify the Italian crop storage question and to make Italy self-sufficient in food as soon as possible was recently announced by the Italian Government working with the Allied Control Commission.

The plans call for two versions of the system so as to provide "peoples' granaries" for wheat and barley.

An estimated 700,000 tons of wheat, approximately 45 per cent. of this year's crop, will be gathered into the new granaries.

Seventy per cent. of the working population of liberated Italy depend on agriculture for their support.

It is estimated that there are one to one and a half million farmers in Southern Italy, mostly small holders.—*Reuter.*

A New Canadian Dehydration Plant

Alberta's first dehydration plant for the processing of vegetables is now in operation. The new plant in North Lethbridge at the present time is working on turnips. Potatoes also will be processed this season and possibly other vegetables.

* * *

Canadian Egg Exports to Britain

The following figures of egg exports to Britain indicate to some extent the phenomenal growth of the Canadian poultry industry in recent years. In 1939 Canada exported to Britain 1,031,820 dozen; 10,677,300 dozen in 1940; 15,580,710 dozen in 1941; 37,535,790 dozen in 1942.

* * *

Penicillin Available to Civilians

Rules for the release of penicillin for the treatment of civilians were officially announced at Canberra recently.

The drug will be supplied only on the production of a certificate signed by two doctors stating that the patient is suffering from one of the following diseases: Septicæmia, pyæmia, meningitis, cerebral abscess, primary bloodborne osteomyelitis, pneumonia, cavernous sinus, thrombosis, gas gan-

grene and tetanus. It must be certified that sulphonamide therapy has failed for pneumonia or meningitis.

Mr. J. M. Fraser, Commonwealth Minister for Social Services and Health, said that only the smallest quantities of penicillin were being made available for civilian use, and only in cases of "life and death" when other drugs had failed.—*Reuter.*

* * *

Canadian Penicillin

The new drug penicillin, credited with remarkable results in certain cases of serious injury and illness, is being manufactured in laboratories at Toronto, Canada, and more recently at Montreal.

* * *

Britain Thanks Australia

Mr. W. Bankes Amery, head of the British Food Mission to Australia, in a message to Australian primary producers, thanked them on behalf of the British people for their share in feeding Britain.

The United Kingdom Food Mission, he said, were aware of the shortages in man-power, fertilisers and appliances, as well as the need to feed "new mouths" in Australia. But they knew that Australia would do her best to prevent a 1944 reduction in British food rations and thus enable war workers to continue to produce for the final assault on enemy strongholds.—*Reuter.*

* * *

New Zealand Food for Britain

Mr. W. Banks Amery, speaking at the New Zealand Dairy Conference held last month, said that he had been assured by Britain that enough ships could be found in 1944 to take all the meat, butter and cheese which could be produced in New Zealand.

The chairman of the Conference said that there was never a more opportune time for the building of a firm foundation of goodwill towards New Zealand's primary industries. Success in the next three years would not only serve the interests of world freedom, but would ensure post-war security.

The industry's job was clear cut, he concluded. Nothing should be permitted to hinder increasing production which would provide it with the maximum ability to face the post-war years with confidence in its own efficiency.

The Conference unanimously voted for the movement to increase dairy production to help the people of Britain.

Mr. Amery urged the dairy industry to make the production of butter and cheese its supreme war aims. Butter is the New Zealand product most urgently required by Britain at the moment, but if an extra 15,000 tons could be produced Britain could then ask for more cheese.—*Reuter.*

* * *

White Sea Flora

One of the Soviet State Scientific Research laboratories is carrying out extensive work on the flora of the White Sea. The head of the laboratory has stated that as a result the seaweeds of the White Sea are to-day being widely used, in one form or another, as food. Restaurants and cafés in Leningrad have used over 230 tons of edible sea cabbage, from which thirty or more tasty dishes have been evolved, greatly in demand from diners-out. Vegetable gelatine, used by the confectionery industries, is also being produced from seaweed.—*Soviet Monitor.*

* * *

Obituary

Dr. Leroy S. Palmer

Dr. Leroy S. Palmer, 56, eminent dairy scientist and chief in the division of Agricultural biochemistry of the Department of Agriculture at University of Minnesota, died on March 8, 1944.

Dr. Palmer had been at the University of Minnesota since 1919 and became head of the division at University Farm just a year ago, succeeding the late Dr. Ross A. Gortner. More than 30 years of research and teaching at the Universities of Missouri and Minnesota had earned for him worldwide recognition as a chemist, especially in the field of dairy science and nutrition. Dr. Palmer was singled out in 1939 to be the first recipient of the Borden Award for outstanding research in the chemistry of milk. He had served for many years as associate editor of the *Journal of Dairy Science.*

While Dr. Palmer's investigations carried him into many of the broad phases of nutrition and vitamin values, his principal interest was in such fields as the pigments of milk and butter, cause of butter defects and storage troubles, the physical and colloid chemistry of milk and the churning process. He carried out extensive research in animal nutrition, with stress on the mineral needs of dairy cattle and the relation of feeding to dairy production and quality.

A great many scientific publications embody the findings of Dr. Palmer and his students. He wrote or made important contributions to seven books. In addition, he was the author or collaborated in the authorship of a great many articles in scientific journals.

Besides his service on the staff of the *Journal of Dairy Science*, he acted in the capacity of councillor for the American Chemical Society and chairman of its Minnesota section; vice-president of the World's Dairy Congress (1923); president of the Minnesota chapter of Sigma XI; consultant to the American Medical Association; collaborator, U.S. Pharmacopœia assay study of vitamins (1935).

Societies

Society of Chemical Industry, Food Group

Dr. J. H. Bushill, hon. secretary of the Food Group, states in his report for the session 1943-44:

The Food Group may congratulate itself on the completion of another successful session. Attendances at meetings may not have been quite as good as during serener days, but it has been evident that the meetings have attracted those members most directly interested in the subjects discussed.

Papers reviewing present-day knowledge in the different investigational fields covered by the Group have continued to figure largely in the syllabus and to prove of great value to the members. Your committee consider, however, that members of the

Group should be accorded more facilities for the presentation of original work and consequently two meetings of the Group each year are being set aside for that purpose.

It is regretted that, owing to the limitation of the paper supply, 1942 Proceedings of the Food Group (Vol. 5), which is now available, will be the last published until the cessation of hostilities. Our able editor, Mr. T. Rendle, will, however, continue in his work to enable publication to be resumed immediately paper is available. The "Nation's Food Series" of the Nutrition Panel is now completed, and its preparation in book form, edited by Mr. A. L. Bacharach and Mr. T. Rendle, is well in hand.

Provincial meetings of the Group have not, it is regretted, been a considerable feature of the Group programme this session, but your committee desire it to be known that joint meetings with provincial sections are particularly welcomed, especially as it enables contact to be made with Group members unable to attend London meetings.

The committee, on behalf of the Group, is very pleased and proud to be able to place on record its congratulations on the conferment of knighthood on the chairman of its Nutrition Panel, Sir Jack Drummond.

This opportunity is taken to remind members that visitors introduced by them are welcome at meetings, and that the Group is always pleased to enrol new members.

Membership of the Group this session has shown a definite increase, being 886 compared with 789 last session.

* * *

The Royal Society

Well-known to those interested in nutritional research and allied subjects, the following have recently been elected into the Fellowship of the Royal Society:

Jack Cecil Drummond, Kt. Professor of Biochemistry, University College, London, and Chief Scientific Adviser to the Ministry of Food. Distinguished for his work on practical nutrition.

Ronald George Hatton. Director, Fruit Research Station, East Malling. He is the pioneer of scientific pomology in this country, and the research work which he has organised and directed in this field has a worldwide reputation.

Franklin Kidd. Superintendent of the Low Temperature Research Station, Cambridge. He has made important contributions to the study of respiration of fruits and is well known for his work on the gas storage and low-temperature conservation of apples.

* * *

Institute of Physics

Physicists employed in industry in Scotland have for some time felt the need of local opportunities for the interchange of knowledge and experience of applied physics. At their request the Board of the Institute of Physics has therefore authorised the formation of a Scottish branch of the Institute, which is to be centred in Glasgow.

The inaugural meeting of the branch took place in April in the Chemistry Buildings of the University of Glasgow. Mr. E. R. Davies, F.Inst.P., a vice-president of the Institute and Director of Research, Kodak, Ltd., delivered an illustrated lecture on "High Speed Photography, and its Applications in Science and Industry."

Further particulars of the branch may be obtained from the acting honorary secretary, Dr. R. S. Silver, F.Inst.P., c/o Messrs. G. and J. Weir, Ltd., Cathcart, Glasgow, S. 4.

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Conference on Controlling and Recording Instruments

The Institution of Chemical Engineers and the Institute of Physics announce a Joint Conference on "Instruments for the Automatic Controlling and Recording of Chemical and Other Processes." Provisional arrangements have been made for the Conference to take place in London on Friday afternoon, September 22 and Saturday morning, September 23. The purpose of the Conference is to promote the interchange of knowledge and experience between those employing automatic controllers and recorders in different fields and to encourage collaboration between physicists and chemical engineers.

The Conference will be open to all interested without charge, whether members of the organising bodies or not.

Further particulars will be sent, in August, to those sending a request for them to the Organising Secretary, Joint Conference, c/o The Institution of Chemical Engineers, 56, Victoria Street, London, S.W. 1.

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Royal Institution of Great Britain

Sir Jack Drummond will be the lecturer at one of the series of Friday Evening Discourses addressed to the members of the Royal Institution of Great Britain and their friends on June 2, at five o'clock. His subject will be: The Hot Springs Conference and its Bearing on Nutrition in Great Britain.

General monthly meetings of the members will be held on Mondays, June 5 and July 3, at five o'clock.

* * *

The Society for Cultural Relations with the U.S.S.R.

The Society for Cultural Relations with the U.S.S.R. informs us that, at the request of a number of members who are interested in scientific work in the Soviet Union, there has been recently prepared a translation of Academician Kapitsa's address to the Præsidium of the Academy of Sciences of the U.S.S.R. on May 18, 1943. This address, and the subsequent discussion, in which many eminent Academicians took part, were considered of such importance that a resolution was passed at the meeting to have them reported in full in the *Vestnik Akademii Nauk* (No. 6, 1943).

Further translations on more specialised scientific subjects are being considered and the society would welcome opinions on the matter. It has been the experience in the past that, unless translations, and especially abridged translations, are prepared and edited by a specialist in the given subject, misstatements and misunderstandings may occur.

The translation of the "Discussion on Academician Kapitsa's Address," and of "Twenty-five Years of Soviet Geology," by

Academician Obruchev, has been arranged. Further titles are also under consideration.

A limited number of duplicated copies will be made available to members of the science section of the society at a price varying from 1s. to 8s. 6d. (depending on the nature of the subject, number of copies required, drawings illustrating the text, etc.). If there is sufficient response from other organisations, the question of making "Scientific Reprints" available in printed form in a greater number of copies, thus lowering the price, will be considered.

The address of Academician Kapitsa to the Præsidium of the Academy of Sciences of the U.S.S.R. was on the "Organisation of Scientific Work in the Institute of Physical Problems." It gives an account of the development of the Institute of Physical Problems, of which he is Director. It deals with the problems of organisation which the Institute had to face in peacetime, and in the war period, when it became urgently necessary to put into practical use the new methods for producing liquid oxygen developed as a result of the research work of the Institute. It also gives Academician Kapitsa's views on the organisation of fundamental research and its relation to industry and technological research. These are of special interest at the present time, when the whole problem of the organisation of scientific research in this country is under consideration.

Academician Kapitsa stresses the importance of giving the research worker in fundamental science full opportunities for using his abilities unhampered by administrative work. The application of such research is, in Academician Kapitsa's view, a separate problem which is in general best undertaken by other workers, specially suited and trained for this work. He also discusses the problem of selection of promising young research scientists, the relation between universities and research institutes, and the organisation and financing of research institutes of the Academy of Sciences.

Agriculture

Agricultural Research

Two of the largest items recently brought before the United States Houses of Congress were 48 million dollars for agricultural research and 320 million dollars for soil conservation. This is certainly carrying out the long-established policy of Congresses since the time of Abraham Lincoln "to diffuse useful knowledge among those who till the soil."

* * *

Agriculture a Partner

The Council of Plymouth Chamber of Commerce recently agreed to arrange a special meeting between local members of the National Farmers' Union and the Chamber of Commerce to discuss ways and means of a closer co-operation between industry and agriculture.

In the running of any successful business it is customary for the partners to get together to discuss developments and obtain a better appreciation of one another's difficulties.

There was a tendency in the past to regard the farmer as a slow-moving individualist, but the remarkable strides made by our farmers in increasing food production by 70 per cent. measured in human food value should finally dispel any illusions that our agriculture is backward. As the Minister of Agriculture said recently, agriculture has during the last four years made greater strides in efficiency than has any other great industry.

It is generally believed that a world shortage of food and consumer goods will continue for some time after the war. Undoubtedly the solution of our difficulties as a nation will largely depend upon the degree of co-operation which is achieved and maintained between agriculture and the other partners in the national concern.

* * *

Drought-Resisting Wheat

Scientific workers of the experimental station for non-irrigation agriculture in Turkmenia have raised three new types of wheat far more drought-resisting than others previously developed. Such wheats are of great importance in the dry regions of the Soviet Republic. Twelve tons of the seed raised on the experimental fields have been sent to collective farms in the Ashkabad Region, where fields sown with the new grain will be under special observation.

Committee on Technical Education

Mr. Butler, President of the Board of Education, has announced in a Parliamentary written answer that the following have been appointed members of a departmental committee to report on higher technological education in England and Wales:

Lord Eustace Percy (chairman), Dr. D. S. Anderson, Sir Lawrence Bragg, Mr. W. H. S. Chance, Sir Charles Darwin, Dr. E. V. Evans, Mr. B. Mouat Jones, Mr. S. C. Laws, Dr. H. Lowery, Mr. H. S. Magnay, Sir George Nelson, Mr. J. F. Rees, Dr. R. V. Southwell, Mr. H. Fitzherbert Wright, with Mr. Maxwell-Hyslop, Board of Education, as secretary. Officers of the Board of Education will attend meetings of the committee as assessors.

The terms of reference of the committee are: "Having regard to the requirements of industry, to consider the needs of higher technological education in England and Wales and the respective contributions to be made thereto by universities and technical colleges, and to make recommendations, among other things, as to the means for maintaining appropriate collaboration between universities and technical colleges in this field."

* * *

Feeding the Young Worker

To those industrialists whose personnel includes juvenile labour —there are upwards of two million young workers between the ages of fourteen and eighteen at the present time—a booklet entitled *Feeding the Young Worker*, published by the Empire Tea Bureau, should be of interest. In its 15 pages it mentions the main points of factory canteen feeding, and a large amount of information on its different aspects is presented in the space available.

Personalia

Mr. Arthur Lock

Mr. Arthur Lock has been appointed a director of R. W. Holden, Ltd., in the capacity of technical adviser and engineer.

While on the staff of the Metal Box Company he organised the service department and advised canners in this country, who at the time were inexperienced. His work in this connexion took him to a large number of canneries in England, Ireland, Scotland and Wales, and also Holland. He also visited South Africa twice, the first time to make a general survey of canning and the second time to assist in organising can factories taken over by the company, and canning generally. Mr. Lock joined Batchelor's Peas, Ltd., in 1937, when he took charge of production at Wadsley Bridge.

In his new appointment with R. W. Holden, Ltd., apart from the valuable work he is now doing at this vital stage in the war effort in the matter of canned food for the Forces, his will be a big influence on the company's post-war activities.

* * *

Mr. J. B. Millar, M.P.S.

Messrs. Cumming, Parsons, Ltd., have announced that Mr. J. B. Millar, M.P.S., has been appointed by Cumming, Parsons, Ltd., technical representative for the south-west counties.

Mr. Millar has been in H.M. Forces for the past three years, serving with the Royal Corps of Signals in Syria, where he had a serious operation, and later was invalided back to this country, since when he has received his discharge.

Prior to joining the Army, Mr. Millar was the firm's representative in Yorkshire and the north-east counties, and to his many friends on that territory he wishes to be kindly remembered. Before taking up residence in the south-west he hopes to have the opportunity of making a personal call upon his old friends.

Fuel Efficiency

Available free of charge from the Ministry of Fuel and Power, London, or from Regional Offices of the Ministry, Fuel Efficiency Bulletin No. 29 is concerned with the industrial use of compressed air.

The Bulletin discusses: The wrong use of compressed air, air leakage, testing for air leaks, dirt filtering, moisture removal, air receiver, pipelines and traps, frictional losses, air compressor (site, water supply and lubrication), maintenance of valves, intercooler and aftercooler, and tools and appliances (tests and drainage).

The unorthodox use of economisers, a very fruitful field for investigation, is the subject of Bulletin No. 30.

The Bulletin begins by telling readers what an orthodox economiser is and what it does, but the most interesting part, even for those who know their economisers, is a group of examples most of which are of unorthodox uses of economisers.

The first example gives the cure for waterhammer in economisers due to high feed temperature, and the second describes the way to cure condensation due to cold feed water.

The next example tells of a works with six boilers where, as a result of a great economy drive, the steam demand was so reduced that three boilers could carry the load. The economiser was now far too large for the smaller amount of feed water passed through it. How the three banks of the economiser were separated and given three separate jobs to do is a lively example of the common-sense approach to fuel economy.

Two more examples describe the manner in which condemned economisers can be given a new lease of life and put to work again in reducing fuel consumption.

Another example tells how an old economiser was converted into an air heater for drying rooms. The next item reminds us that some kilns and furnaces, as well as boiler plant, lend themselves admirably to the application of an economiser. Another section provides an answer to the problem of the feed pump which will not handle water above a certain temperature. There is a rough but useful guide for the height of a feed tank above the pump suction under different conditions of feed water temperature.

The economiser examples are well illustrated by diagrams, and at the end of the bulletin is a quick-reference summary of economiser points.

The Bulletin is a really valuable addition to fuel efficiency literature. Readers should get into touch with their Regional Fuel Efficiency Committee for copies.

* * *

Worked 80 Hours a Week

Thomas Frederick Rees (37), Whitecastle Farm, Llantilio Crosenny, near Monmouth, was fined £2 on each of three summonses at Craig for failing to attend H.G. parades.

Rees pleaded that he farmed 229 acres—204 arable—was an agricultural contractor with threshing outfit, lorry and baler, and cultivated land for others.

Major McLaverty said Rees had paraded only once since he joined the Home Guard. He did not dispute that Rees worked eighty hours a week. Other farmers did not finish until 7 o'clock at night and attended parades.

Colonel W. C. N. Lee said the Home Guard authorities were reasonable, but Rees flouted everything. Agricultural workers were only entitled to be discharged from the Home Guard if they were over forty and working continuously very long hours during the winter.

Notice of appeal was given.

Information and Advice

Drying of Vegetables

9,214. *We possess two driers, round horizontal, with steam jacket, which we converted into retorts, but it would be quite simple for us to reconvert them into driers if they would be suitable for dehydration. We think that if it were possible for us to accomplish this job correctly we could ship a quantity of vegetables to the British market.* (Eire.)

The drying of vegetables is a highly technical business and we would not advise the attempt to use improvised equipment on a commercial scale. Moreover, the drying operation is not the only one connected with the production of dried vegetables and it would be impossible for you to obtain the necessary items of plant at the present time without a licence. To gain an idea of the chain of operations in vegetable drying, you should read the article on the subject in FOOD MANUFACTURE, September 1, 1943.

Sealing Cartons

9,220. *Required names of manufacturers making Pressing Machine for sealing down cartons containing canned goods.* (Lincs.)

By cartons we presume you mean "outers" intended to contain bulk supplies of canned goods. Assuming this to be the case, we know of no machine performing the operation you suggest. We have always found that the best way of sealing down containers is to use a machine for stitching the bottom flap with gummed tape. In addition, the whole carton should be bound with steel tape or wire to keep the container intact during transport. When the packages reach their destination, by merely breaking the wire or tape, the empty containers can be returned to you for future use.

Names of firms making stitching and strapping machines were given.

Estimation of Moisture Content of Foods

9,213. *In connexion with the possibilities of an electrical instrument giving a direct reading of moisture content of certain raw or manufactured foods, the following information is required:*

1. *Are manufacturers or handlers of dehydrated meat and vegetables, flour, bread, dough, biscuits, powdered milk, sugar and tea interested in moisture content of those goods?*
2. *For what purpose do they require the knowledge?*
3. *To what degree of accuracy do they require to know it* (e.g., *within 0·1 per cent., 1 per cent., 5 per cent.*)*?*
4. *Are they, as a whole, employing any scientific method at present for such determination* (e.g., *accurate weighing and drying of a sample*)*?*
5. *In your opinion would such an instrument as we mention be of major use in the industry concerned?*

1. Moisture determinations are widely made in the food industry as a routine measure, although some of the products you mention are not commonly tested, *e.g.*, bakers do not test their loaves for moisture.

The degree of accuracy required varies considerably.

2. For the purpose of controlling quality and keeping properties of foods..

3. The degree of accuracy required varies. For factory control work, at certain stages of manufacture 1 per cent. might be satisfactory, but for finished products it would be in the region of 0·1 per cent.

4. Determinations are usually made by a heat drying method. There are many modifications—drying in air, under vacuum, etc. Another method is by distillation and measurement of condensed moisture.

5. An instrument such as you mention would be of limited use in the food industry. A conductivity method was worked out some time ago for the determination of salt in certain food products. Its use for moisture determinations would probably be confined to natural products of a standard nature. Deviations in composition, due for instance to added substances such as salt, would affect results..

Information Supplied

9,138. *Names of firms supplying a new form of lecithin from ground nuts mentioned in the article in* FOOD MANUFACTURE, *February*, 1944, "*The Baking Industry*," *by J. Stewart.* (Notts.)

9,139. *Names and addresses of firms supplying potato flour.* (Ayrshire.)

9,140. *Manufacturers of closures for fruit bottles.* (Hants.)

9,141. *Manufacturers or patentee of multiple potato eyeing machine.* (Liverpool.)

9,142. *Manufacturers of instrument known as a "humatagraph", used for measuring the moisture content of timber used in the manufacture of wooden cases for War Department food contracts.* (Scotland.)

9,143. *Names of manufacturers of vacuum cleaners suitable for cleaning corn and flour stores.* (Burton-on-Trent.)

9,144. *Names of firms manufacturing* (1) *a bean snipper capable of handling runner beans,* (2) *an automatic filler for white beans, peas, dried beetroot, etc.* (Wors.)

9,145. *Names and addresses of manufacturers of a machine for gutting and boning herring.* (Manchester.)

9,146. *Details of a method of auxiliary gas firing.* (Leeds.)

9,149. *Deterioration of cereals at the bottom of galvanised bins.* (Lancs.)

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. the Controller of H.M. Stationery Office. The journal can be obtained from weekly (annual subscription £2 10s.).

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

556,653. WINGFOOT CORPORATION: Processing of cheese.

556,659. WAITE, J. N.: Machine for peeling potatoes and other root vegetables.

556,672. WARD, H. H.: Treatment of flour for controlling its strength.

556,808. AFRICAN SISAL AND PRODUCE CO., LTD., and BROWNE, R. J.: Production of pectin or pectic substances from plants of the agave species.

556,854. AMERICAN DAIRIES INC. and QUAKER OATS CO.: Method of separating water-soluble vitamins from other water-soluble materials.

557,093. HALL, LTD., J. AND E., and HIRSCH, M.: Cooling at low temperatures.

557,099. WIND, S. DE, and CRUICKSHANK, J.: Fish-dressing machine.

557,110. DONNELLY, W. J., and LONDON PASSENGER TRANSPORT BOARD: Device for slicing or cutting bread rolls or other commodities.

557,124. HEINSEN, F. E.: Outdoor tomato ripener and forcer.

557,181. DANDY, T.: Machine for dressing dried peas and other cereals.

557,227. ISHERWOOD, F. A.: Preservation and storage of dried leafy and root vegetables.

557,260. ROBSON, P. T., and ALEXANDER, A. E.: Preservation of foodstuffs such as fruits, jams, preserves and the like.

557,282. GREENSTED, C. G., and CANTERBURY AND DISTRICT CO-OPERATIVE SOCIETY, LTD.: Bodies of trucks or cars for milk distributors and for analogous purposes.

557,381. TEMPLETON, R. A. S., and FARMERS' MARKETING AND SUPPLY CO., LTD.: Preparation of potatoes and like vegetables for drying.

557,483. FERREE, J. C., GORDON, A. B., and SOYA FOODS, LTD.: Production of an edible product from soya beans and other protein-containing materials.

557,567. FRIEDRICH, C. H., and SMITH, M.: Machine for boning eviscerated herrings and cutting the boned herrings into parts.

557,973. NATIONAL BISCUIT CO.: Methods of producing puffed cereal flakes and the products of said methods.

557,804. MERCK AND CO., INC.: Synthesis of vitamin B_6.

557,805. MERCK AND CO., INC.: Synthesis of vitamin B_6.

557,872. POTTS, H. E. (DISTILLATION PRODUCTS, INC.): Manufacture of human and animal foodstuffs.

557,922. SPEIGHT, J.: Centrifugal dressing machines and other rotary sifters primarily for separating flour and meal from cereal products.

Abstracts of Recent Publications

Improvements in the Method of and Machines for Slicing Food

This invention relates to the method of and machines for slicing articles of food such as vegetables, fruit and other foodstuffs capable of being sliced, and has for its object to effect the slicing more expeditiously and economically than hitherto.

Articles of food are sliced according to this invention by a method which consists in positioning a plurality of articles of food substantially at rest and in alignment upon a reciprocally traversed surface incorporating one or more slicing elements, whereby the articles are subjected to the action of the said slicing elements for the cutting of slices from said articles at each to and fro movement of said slicing element or elements.

The extent of reciprocal movement of the slicing elements may be such that a plurality of articles are acted upon by each slicing element during its forward and rearward stroke.

A machine for slicing food, made according to this invention, comprises a reciprocable member carrying a plurality of slicing elements reciprocable therewith and fixed thereto each over a slice discharge opening in the said reciprocable member, a stationary supporting member spaced above the reciprocable member, and provided with a plurality of holders for articles of food adapted to support the said articles of food substantially at rest upon the reciprocable member for subjection to the action of the slicing elements at each to and fro movement thereof.

The slicing elements may be adjustably secured to the reciprocating member to permit of their spaced relation thereto being varied to suit the required thickness of slice to be cut.

551,708. Batchelor's Peas, Ltd., Arthur Ernest Taylor and Arthur Lock.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

LITTLE JOHN.—624,400. Vegetables, fruit. milk, meats, fish and nuts, all beng dried or tinned; glacé fruit, desiccated coconut, butter, cheese, jams, marmalade, pickles. **Joseph Burton and Sons, Ltd.,** Corner of Stanley Place, Talbot Street, Nottingham; General Merchants and Importers.

CARDI.—624,794. Cereal meal for human consumption; flour. **Gwili Farmers Supply, Ltd.,** Angel House, Lammas Street, Carmarthen; Merchants.

MERRY MONARCH.—625,225. Sugar confectionery (not medicated). **Needler's, Ltd.,** The Chocolate Factory, Bournemouth Street, City and County of Kingston-upon-Hull; Manufacturers. To be Associated with No. 516,055 (2763) xlii.

BUTTRESS.—625,851. Edible oils and edible fats. **Benninga (Mitcham), Ltd.,** 33, Mortimer Road, Mitcham; Manufacturers.

New Companies

Canners Agences, Limited. (384151.) Finsbury Pavement House, 120, Moorgate, E.C. 2. To carry on bus. of food preservers, canners, packers, etc. Nom. cap.: £20,000 in £1 shares. Dirs.: to be appointed by subs. Subs.: S. A. Lancaster, Finsbury Pavement House, Moorgate, E.C. 2; Nora L. Willy, 181, Boundary Road, N. 22.

Lee's Pickles, Limited. (384186.) Consort Road, Eastleigh, Hants. To take over bus. of a pickle and sauce mnfr., cd. on at Eastleigh by Mrs. Eva J. Lee. Nom. cap.: £1,000 in £1 shares. Dirs.: P. M. Rogers, Mrs. P. M. Rogers and Mrs. E. J. Lee, all of 68, Twyford Road, Eastleigh; E. Beal, Red Bungalow, Pine Road, Chandler's Ford, Eastleigh.

Daniel's Bakery, Limited. (384284.) 3, Lonsdale Gardens, Tunbridge Wells, Kent. To carry on bus. of biscuit mnfrs., bakers, etc. Nom. cap.: £1,200 in 600 cum. red. pref. and 600 ord. shares of £1 each. Dirs.: C. J. Maples, Broomham, Catsfield, nr. Battle, Sussex; J. A. McNab, Spa Hotel, Tunbridge Wells; F. T. Hussey, Marden, Kent.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.